

# THE IRON AGE

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## Measuring the Flow of Compressed Air

A Curve to Facilitate the Calculation of the Weight of Air Flowing Through Orifices—Some Examples Worked Out

BY THOMAS G. ESTEP, JR.

The problem of metering, with a reasonable degree of accuracy, the flow of air under pressure, is one that arises very often in engineering practice, and until recently has always been difficult, both in the method to be used and in the calculations that are required. Proportional meters and displacement tanks have been used and are fairly accurate, but the equipment necessary is very expensive and the end does not often justify the means. The simpler methods are the throttle disc and the pitot tube, but the great trouble here is to determine accurately the coefficient of discharge which will vary under varying conditions of flow.

In the last few years very exhaustive investigations have been made on the flow of air through well-rounded orifices, and it has been found that with a certain shape of orifice the coefficient of discharge will remain practically constant over a wide range of conditions and is nearly equal to unity. This at once gives us a very accurate method of determining the quantity of air flowing and at the same time requires very little apparatus. All the equipment necessary is an accurate thermometer, a means of determining the pressure on the two sides of the orifice and a standard orifice. All recent handbooks for engineers give the shape of the standard orifice with the coefficients of discharge for each shape.

Probably the most common case where it is necessary to measure the flow of air is in the testing of compressors in order to determine the real volumetric efficiency, particularly the larger compressors, such as the blast furnace blowing engines.

One reason that the standard orifice method is not used more is probably the fact that after the observed data are obtained the calculation of the quantity of air flowing is laborious and somewhat difficult. In order to facilitate this calculation, a

curve has been prepared, and by its use the calculation has been very much shortened and reduced to simple arithmetic.

It can be proved that the velocity of the air in the orifice, for a given ratio of pressures on each side of it, is given by the equation,

$$W_2^2 - W_1^2 = 2g \frac{n}{n-1} RT \left[ 1 - \left( \frac{p_2}{p_1} \right)^{\frac{n-1}{n}} \right]$$

Where:

$W_1$  = initial velocity, or velocity at pressure  $p_1$  in feet per second.

$W_2$  = velocity at pressure  $p_2$  in feet per second.

$g$  = acceleration due to gravity in feet per second.

$n$  = ratio of the specific heat at constant pressure to the specific heat at constant volume.

$R$  = constant, and is equal to 53.34 for air.

$T$  = absolute temperature at pressure  $p_1$  in degrees Fahr.

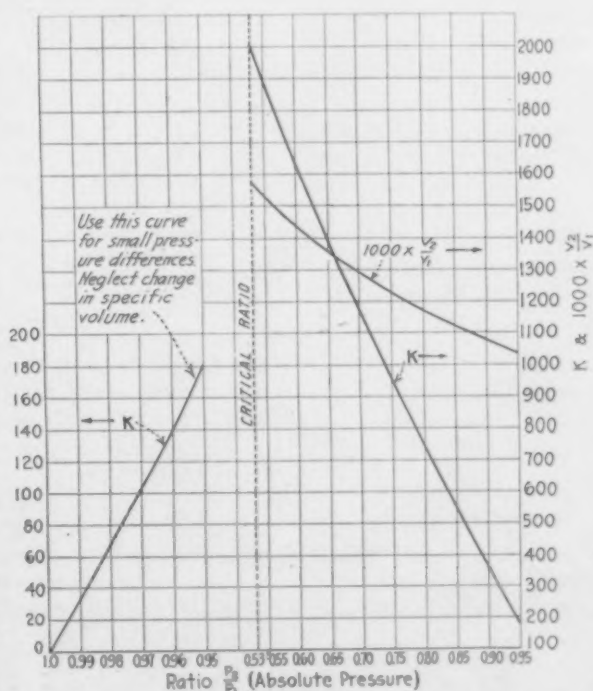
$p_1$  = pressure of air just before it enters orifice, in pounds per square inch absolute.

$p_2$  = pressure in the orifice, in pounds per square inch absolute.

A peculiar condition arises in relation to the pressure  $p_2$  due to what is known as the critical ratio. So long as the ratio of the pressure of the region into which the orifice is discharging to the initial pressure  $p_1$  is equal to or greater than 0.53, the pressure  $p_2$  in

the orifice is the same as the pressure of the region into which the orifice is discharging, but when the above ratio is less than 0.53, the pressure  $p_2$  takes the value 0.53  $p_1$  and remains constant at that, no matter how much the pressure of the region into which the orifice is discharging is reduced.

To illustrate this, assume that  $p_1$  is 100 lb. per sq. in. absolute and the pressure on the other side of the orifice is 70 lb. per sq. in. absolute. The ratio here is 0.7 which is greater than 0.53, hence the pressure  $p_2$  in the orifice is 70 lb. But suppose that the pressure on the discharge side is 40 lb. per sq. in. absolute. Then the ratio is 0.4, which is less than 0.53, hence  $p_2$  takes a value 0.53  $p_1$ , or 53 lb. per



A Curve to Facilitate the Calculation of the Weight of Air Flowing Through a Standard Orifice

sq. in., and no matter if the pressure on the discharge side is reduced still further,  $p_2$  remains constant at 53 lb. per sq. in. absolute. This means that the maximum velocity in the orifice is reached when the ratio of pressures on the two sides is equal to 0.53.

In the equation for velocity given above, it is usually assumed that  $W_1$  is equal to zero. It is always so small compared to  $W_2$  that this assumption introduces very little error. It is also assumed that the expansion of the air in the orifice is adiabatic.

An examination of this equation shows that for a given pressure ratio  $\frac{p_2}{p_1}$  all the quantities in the equation are constant except  $T$ . Hence let

$$K = 2g \frac{n}{n-1} R \left[ 1 - \left( \frac{p_2}{p_1} \right)^{\frac{n}{n-1}} \right]$$

and then

$$W_2 = \sqrt{KT}$$

The weight of air discharged is equal to the area of the orifice multiplied by the velocity and divided by the specific volume, or

$$M = \frac{C \times A \times \sqrt{KT}}{V_2}$$

where  $M$  = weight discharged, pounds per second.

$C$  = coefficient of discharge.

$A$  = area of orifice in square feet.

$V_2$  = specific volume at pressure  $p_2$ , cubic feet.

$V_2$  is not easily determined, but for each value of  $\frac{p_2}{p_1}$

there is a corresponding value for  $\frac{V_2}{V_1}$ , where  $V_1$  is

the specific volume at the pressure  $p_1$  and the temperature  $T$ .  $V_1$  can be readily determined by the use of the simple relation

$$V_1 = \frac{RT}{144p_1}$$

Then the equation for weight may be written,

$$M = \frac{C \times A \times \sqrt{KT}}{\left( \frac{V_2}{V_1} \right) V_1}$$

The curve of  $K$  has been plotted by choosing successive values of  $\frac{p_2}{p_1}$  and solving for  $K$  and also finding the value of  $\frac{V_2}{V_1}$  for each value of  $\frac{p_2}{p_1}$ .

For small differences of pressure, a curve has been plotted to an enlarged scale, in which the ratio of specific volumes has been neglected, for this ratio is so near unity that the error is very small.

A few problems will now be solved to illustrate the use of the curve. Suppose air at an initial pressure of 100 lb. per sq. in. absolute and a temperature of 70 degrees Fahr. or 530 degrees absolute, is allowed to flow through a standard orifice, having a cross sectional area of 2 sq. in., into a region of pressure of 60 lb. per sq. in. absolute.

What weight is flowing? First  $\frac{p_2}{p_1} = \frac{60}{100} = 0.6$  which is greater than 0.53 so that  $p_2$  is equal to 60 lb. From the curve, when  $\frac{p_2}{p_1} = 0.6$ ,  $K = 1620$  and  $\frac{V_2}{V_1} = 1.44$ .

$$V_1 = \frac{RT}{144p_1} = \frac{53.34 \times 530}{144 \times 100} = 1.96 \text{ cu. ft.}$$

Let the coefficient of discharge be equal to 0.98.

Then

$$M = \frac{C \times A \times \sqrt{KT}}{\left( \frac{V_2}{V_1} \right) V_1} = \frac{0.98 \times \frac{2}{144} \times \sqrt{1620 \times 530}}{1.44 \times 1.96} = 4.47 \text{ lb. per sec.}$$

Suppose that the conditions are the same as in the previous problem, except that the pressure of the region into which the orifice is discharging is 30 lb. per sq. in. absolute, instead of 60 lb. In this case

$$\frac{p_2}{p_1} = \frac{30}{100} = 0.3, \text{ which is less than } 0.53, \text{ so that } p_2 \text{ is}$$

equal to  $0.53 p_1$  and the ratio is then 0.53. For this ratio,  $K = 2010$  and  $\frac{V_2}{V_1}$  equals 1.57. As before,  $V_1$

= 1.96 cubic feet. Then the quantity discharged is

$$M = \frac{C \times A \times \sqrt{KT}}{\left( \frac{V_2}{V_1} \right) V_1} = \frac{0.98 \times \frac{2}{144} \times \sqrt{2010 \times 530}}{1.57 \times 1.96} = 4.71 \text{ lb. per sec.}$$

Take the same conditions as in the previous problem, except that the pressure of the region into which the orifice is discharging is 97 lb. per sq. in.

absolute instead of 60 lb. Here the ratio  $\frac{p_2}{p_1}$  is equal

$$\text{to } \frac{97}{100} = 0.97, \text{ which is greater than } 0.53. \text{ Use the}$$

curve plotted to the larger scale, from which we find that  $K = 104$ . The ratio of specific volumes may be taken as unity. Then quantity flowing,

$$M = \frac{C \times A \times \sqrt{KT}}{\left( \frac{V_2}{V_1} \right) V_1} = \frac{0.98 \times \frac{2}{144} \times \sqrt{104 \times 530}}{1 \times 1.96} = 1.63 \text{ lb. per sec.}$$

From the above examples, it is seen how much the curve simplifies the calculation. Other uses will suggest themselves to the engineer, particularly those who have a knowledge of the theory of the flow of elastic fluids. By introducing certain other factors in the equation, the curve can be made to apply to gases other than air.

A word of caution might be given here in the use of standard orifices for measuring the flow of air. The flow through the orifice must be constant; if it is pulsating or fluctuating, a large error will result. In case the flow is not steady, it should be made so by means of tanks and throttling.

### Russia's Iron and Steel Output

Russia's production of pig iron, semi-finished and finished steel in the last two years, according to *L'Economiste Européen* of Sept. 29, 1916, was as follows in net tons:

	1914	1915
Pig iron .....	4,769,300	4,062,100
Semi-finished steel.....	5,308,800	4,539,100
Finished steel .....	4,334,100	3,599,500

Central Russia is credited with over 70 per cent of the total pig-iron output, the Ural region coming second. Central Russia also leads in semi-finished and finished steel, making 60 per cent of the total semi-finished steel, while the Ural region made 20 per cent. In 1914 Poland produced 269,500 tons of pig iron, 389,900 tons of semi-finished steel and 313,000 tons of finished steel.

Belgium's coke output for the first half of 1916, according to a German source, was 408,812 metric tons. The briquette and coal output was 1,077,735 tons and 8,478,732 tons respectively.

## NEW RIFLE MACHINERY

### Twelve-Spindle Drilling and Reaming Machines at New England Westinghouse Plant

Responding to the pressure for small arms brought about by the warfare in Europe, rifle making in this country is making rapid strides toward larger production. Keeping pace with this larger production is the increase in accuracy and general excellence of the output. One of the aggressive rifle manufacturers in America in this regard is the New England Westinghouse Company, with plants in Chicopee Falls and Springfield, Mass., and Meriden, Conn. Particularly interesting is the East Springfield plant of this company wherein are many new developments in rifle-making machinery.

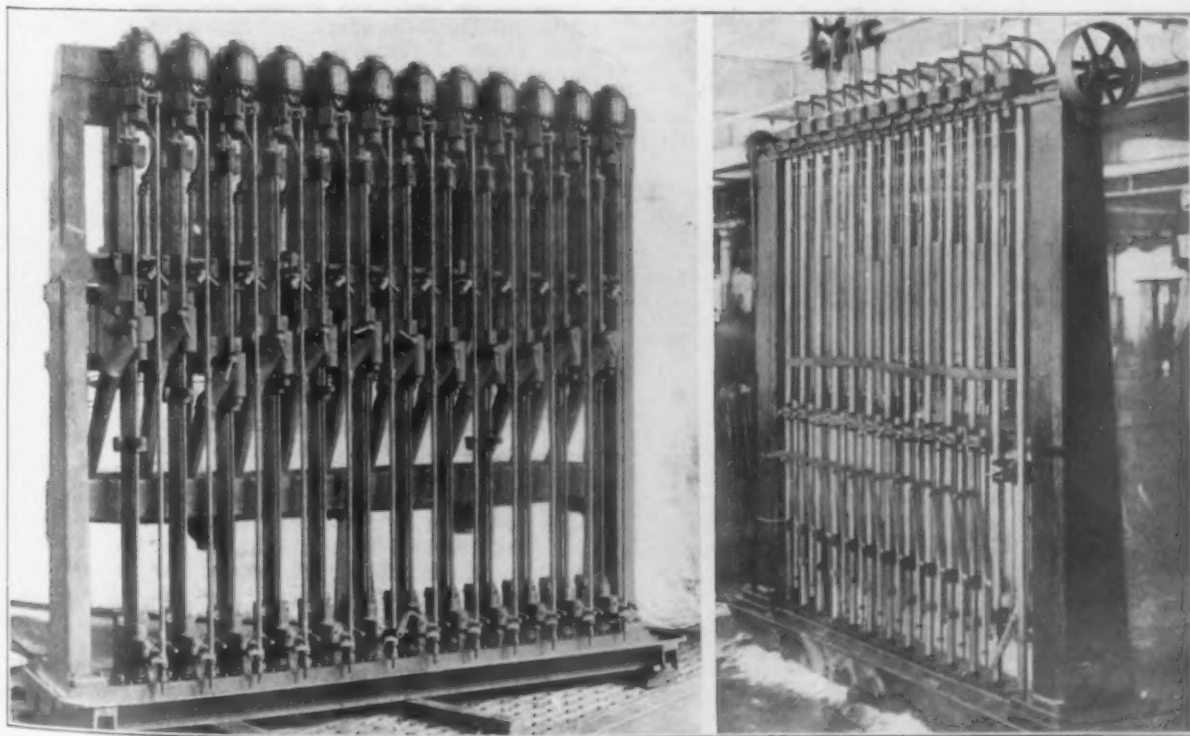
A new type of barrel-drilling machine and a new type of barrel-reaming machine, developed by the company from designs of Walter L. Clark, its general manager, are notable illustrations of the progress which has been made. The standard type of barrel-drilling machine is a horizontal two-spindle machine. The new type of machine holds the barrels in a vertical position and has twelve spindles, each driven by an individual motor. It occupies precisely the same floor space as a two-spindle machine, and is handled by one operator. This one statement makes plain the economies brought about by this new type. Moreover, with an independent drive for each spindle by an adjustable-speed motor, the speed of each spindle can be quickly set to suit the kind of steel which may happen to be in use. If, by reason of a drill sticking or becoming dull, a motor is consuming too much power, the spindle is instantly stopped by the action of an automatic switch set so that the motor stops when loaded beyond a predetermined point.

It has been found in practice that the vertical position of the barrel has marked advantages. With the barrel in a vertical position, the pull of gravity is parallel to the axis of the barrel, making it possible to obtain a true hole and aiding to keep the drill clear of chips.

Most of the details of this machine are made clear in the left portion of the accompanying illustration. The barrels alone are rotated and the drill is fed into the barrel from below. The illustration shows how the lead screw is driven. This feeds the drill chuck upward, also a traveling guide for the drill shank. The oil is supplied from oil mains in ducts in the floor from a central pump at a pressure of 800 lb. to the square inch. It enters the machine at the top, flowing through the piping system shown on the top half of the machine and is conducted by flexible pipes to the cored drill chucks, flowing up through the drill shank and being discharged through a hole at the lip of the drill as in the ordinary practice for this operation. From the barrel it flows down through a chute into the tank shown on the back of the machine. The bulk of the chips are removed directly from the tank and the oil recovered for further use by the usual separating methods.

In the 12-spindle reaming machine are similar advantages. It takes no more floor space than the older type of machine and the compact placing of the spindles makes it readily handled by one operator. In this machine the barrels are swung from a universal joint, producing a floating action which enables the reamer to follow accurately the drilled hole. By the use of counterweights a feed is obtained which automatically adjusts itself to the varying conditions always present in this operation. Thus if the amount of stock to be reamed out is more than normal, the reamer slows up to meet this condition; if it encounters a hard spot in the barrel, it feeds more slowly through this portion. The counterweights can be placed on the cross-head to give a pulling action on the reamer, or the feed can be reversed and the reamer pushed through the barrel.

The vertical position of the machine makes it possible to utilize the advantageous method of feeding the oil through the shank of the reamer. The oil enters at the top of the machine as in the barrel-drilling machine and is led to the reamer shanks through a similar system of pipes. The barrel-



These Two Machines Mark a Departure from the Accepted Practice of Drilling and Reaming Rifle Barrels in That the Pieces Are Held Vertically. The production is increased six-fold without occupying more floor space than the two-spindle horizontal machines supplanted



drilling machine has also been successfully adapted to the operation of drilling receivers.

The machines are marketed through the Walter H. Foster Company, 50 Church Street, New York.

### Heavy-Duty Manufacturing Lathe

The Himoff Machine Company, 128 Mott Street, New York, has placed a heavy-duty manufacturing lathe on the market. It was designed especially for heavy duty plain, taper and form turning and is the outgrowth of a machine originally designed with the single idea of turning shells rapidly. All of the classes of work usually handled by an ordinary lathe can be machined except thread cutting, which is done by a thread milling machine. The lathe is intended for turning projectiles and forgings where the finished diameter does not exceed 9 in. A chain is used for driving the feeds.

Box-section construction is used and the bed is provided with a number of box-type cross ribs to serve as reinforcement and to resist twisting strains. Two V's are provided, one to guide the head and tail stocks and the other for the carriage, the latter being large. The headstock contains a large diameter, two-step cone pulley designed for a 5-in. belt. The spindle, which is of large diameter, is a steel forging of between 0.50 and 0.60 per cent carbon. It is ground at bearing points and has a 2½ in. hole extending entirely through it. A chain oiling system is relied upon to lubricate the bearings positively, and as a check on the working of the system sight-feed oilers are provided. A hardened steel washer at the rear bearing takes the thrust and a nut at the rear provides an adjustment to take up wear. The tailstock is of the extension barrel type which, it is pointed out, gives clearance over the carriage bridge for turning short work. The spindle, which is 3½ in. in diameter and has a travel of 6 in., is provided with a No. 5 Morse taper. A plug binder clamps the spindle without, it is emphasized, affecting the alignment. The tailstock is fastened in position by four bolts.

The saddle is driven by a large-diameter splined shaft through a worm gear and a friction cone device forms a part of the drive and is relied upon to eliminate the danger of breakage through accident or negligence. Steel forgings are used for all the apron gears, which are keyed to shafts having both front and rear supports. Oil tubes extending from the front of apron are employed to oil the bearing points. The saddle is wide and has a bearing of 32 in. on the ways. The tool slide, which is 11¼ in. wide, is equipped with the so-called European tool post, thus enabling two or more tools to be held at one setting. The feeds are

driven positively by a chain. The use of change gears provides five rates ranging from 0.02 to 0.10 in. per revolution of the spindle. An adjustable collar on the splined shaft is provided and can be set to stop the carriage after each operation. As the apron is moved along the bed and reaches the end of its travel, it strikes this adjustable collar, causing a positive jaw clutch in the gearbox to be disengaged. This clutch automatically engages itself again when the saddle is moved to the left.

The following table gives the principal dimensions and specifications of the lathe:

Length of bed, ft.....	8
Height from floor to spindle center, in.....	40
Swing over V's, in.....	21
Swing over slide, in.....	11
Net weight, lb.....	4,750
Export shipping weight, lb.....	5,400
Contents of case, cu. ft.....	26

### National Founders' Meeting Next Week

A wide variety of topics of vital interest to the business men is scheduled for the annual meeting of the National Founders' Association to be held at the Hotel Astor, Nov. 15 and 16. Half-hour talks are announced as follows for Wednesday afternoon:

"The National Industrial Conference Board," by M. W. Alexander, West Lynn, Mass.

"How Shall Manufacturers Contribute to American Industrial Progress," by E. W. Rice, Jr., president General Electric Company, Schenectady, N. Y.

"The Banker's Relation to Industry," by Frank A. Vanderbilt, president National City Bank, New York.

"Proposal for Increasing the Effectiveness of the National Founders' Association," by Ely Griswold, Griswold Mfg. Company, Erie, Pa.

The convention will open at 10:30 a. m. Wednesday morning and, besides the reports of officers, the general counsel of the association, George F. Monaghan, will deliver an address on "Industrial Legislation"; A. F. Corbin, as chairman, will make a report of the association's committee on safety and sanitation, and J. J. Wilson, as committee chairman, will report on "Foundry Methods." Following the morning session and a buffet luncheon, the half-hour talks mentioned for the afternoon will take place.

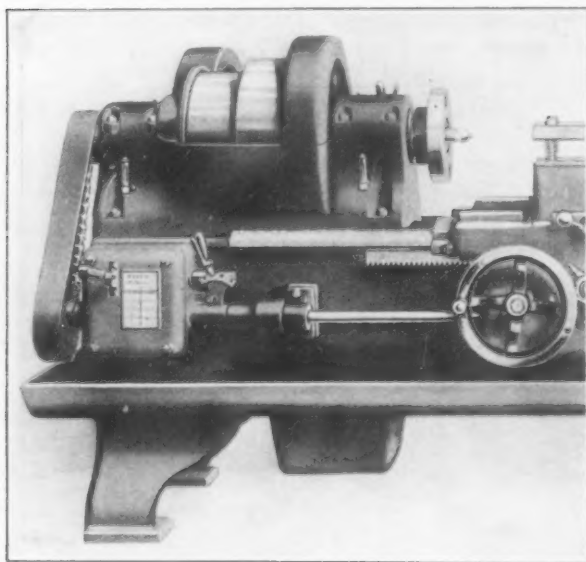
On Wednesday evening will occur the annual dinner and the speakers for the banquet, at which President William H. Barr will preside, are Frederick P. Fish, Boston, who is to speak on "Industrial Co-operation," and James A. Emery, Washington, D. C., whose address is "The Story of San Francisco."

The Thursday morning session, called for 10 a. m., is to devote itself to an address on "Pittsburgh Strike Situation," by Edward Kneeland, United Engineering & Foundry Company; "The Responsibility of the Individual Employee," by Edward K. Nicholson, counsel, Bridgeport Manufacturers' Association, and "Joint Conference Board on Apprentices," by W. H. Van Dervoort, president National Metal Trades Association. The remainder of the session will be given up to reports of committees and the election of officers.

### Pittsburgh Office for Steel Exports

The American Steel Export Company, Woolworth Building, New York, has opened a Pittsburgh office under the direction of Charles E. McKillips, Jr., in the Farmers' Bank Building. In view of the volume of its transactions with Pittsburgh district mills, the company has decided to establish this service bureau to facilitate the handling of its orders. All purchases will be made as heretofore through the main office in New York.

Aluminum exports from Switzerland to Germany in 1915, according to Swiss reports, were 12,000 to 14,000 tons. Before the war Germany obtained aluminum from Switzerland, France and Canada. The Aluminum Industrie A. G. is now the largest source of the German aluminum supply, with the largest plant at Chippis, in Valais, at the junction of the Rhone and the Navizance.



The Headstock End of a Heavy-Duty Lathe Equipped with a Chain Drive for the Feeds and Capable of Doing Plain, Taper and Form Turning but Not Thread Cutting



# Determining Carbon in Steel by Combustion

Ten Analyses Each Hour in the Laboratory of a Large Automobile Company—Details of the Arrangements and the Results

BY JACOB W. BARBEY\*

THE working conditions in the chemical laboratory of one of the largest automobile companies required a large number of carbon determinations and the development of a very rapid and accurate method. The work had to be done by a single operator. It is possible to obtain accurate results, under the conditions outlined, at a speed of 10 determinations per hour. In the following, a brief outline of the chemical operation and a more detailed account of the mechanical features is given.

The well-known rapid method of direct combustion of the steel and the absorption of carbon dioxide in potash was chosen. The carbon train consists of an oxygen tank, purifier, furnace, purifier and a potash bulb. The first purifying train is made up of, in order, a Johnson bulb filled with liquid potash, a mercury gage connected by a T tube, and third, a tower filled with calcium chloride. The furnace is an ordinary Hoskins tube furnace with a 30-in. quartz tube. Provision is made for advancing the tube as it becomes clogged with oxide. Following the tube is a U tube containing in order granulated zinc, calcium chloride and phosphorus pentoxide introduced and separated by glass wool. The use of the chloride tends to lengthen the life of the phosphoric acid and save refilling. The bulb used is an enlarged form of Geissler bulb, made to order. The bulb contains potash, Sp. Gr. 1.27. The first half of the drying tube contains broken stick KOH and the second half  $P_2O_5$ , introduced in small quantities by the use of glass wool.

The capacity of this bulb is 100 to 150 determinations and a weight increase of four to five grams. The bulb is connected and the oxygen passed at the rate of 340 c.c. per minute, indicated by gas meter at the end of the train, and the position of the mercury noted. At the end of five minutes the bulb is disconnected and weighed against another bulb similarly filled (a discarded one). The apparatus is then ready for use. During a series of combustions the oxygen is never turned off, saving the loss in time and annoyance of readjustment. A half-factor weigh, 1.3636 gram of sample, is used, laid on alundum-contained in a platinum boat.

A table of operations and a thorough time study of all the individual units revealed a great loss of time and expenditure of effort in carrying the bulb to and from the balance and the samples to the boats. This was then absolutely eliminated by moving the balances close to the train, or vice-versa. A tube was led from the last dryer to the balance and directly to the bulb on the pan through the side door. Aside from the time and energy saved, the bulb temperature and surface moisture condition is never changed, is absolutely parallel by the counter balance and can be weighed absolutely accurately at once.

The following table of operations gives the average time required for each unit and the routine work to be done by the operator as ascertained by a test run on four different classes of steels.

Table of Operations: Conditions—Bulb Weighed and Oxygen Gas Running at Required Speed

No.	Name	Time		Routine
		Unit Sec.	Total Min. Sec.	
1	Connecting bulb...	17	0 17	
2	Withdrawing and inserting boat...	37	0 54	
3	Time to ignite....	40	1 34	Putting chips in boat for next determination.
4	Ignition .....	59	2 33	Figuring last determinations and adjusting weights for this one.
5	Sweeping out $CO_2$ ...	120	4 33	Weighing out two samples (2 x 40") Record No's.
6	Disconnecting bulb '12	12	4 45	Determine the position of rider as closely as possible by sensitivity of balance before taking a full swing to verify.
7	Weighing .....	61	5 46	

From this table and the illustration the exact conditions can be realized. The fastest determination has been made in 5 minutes and 7 seconds. An average rate is 10 combustions per hour. The out-



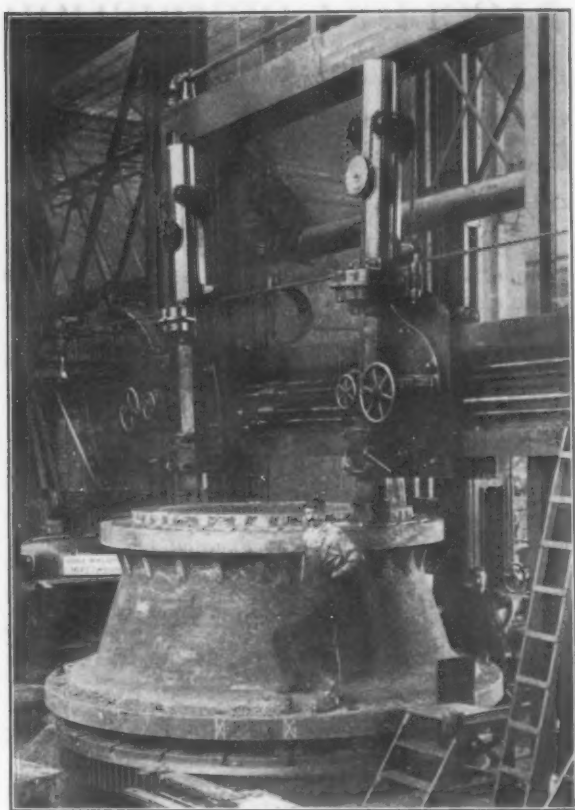
General Arrangement of the Apparatus in the Laboratory of the Packard Motor Car Company for Rapid Combustion of Carbon in Steel

put on one single 8-hr. day was 70 combustions in a running time of 7 hours and 9 minutes, the rest of the time being used for bulb filling and other work. Inasmuch as there are two three-minute rest periods every alternate two determinations, the operator has a total rest of 25 per cent and should not be overly fatigued. Routine checks average under one point with a maximum of one and one-half points of carbon, a control of 0.746 per cent on a 0.745 per cent Textor standard being not unusual.

Further study of the table may show where changes and improvements consistent with all other factors are possible.

The plant of the Pacific Steel Products, Ltd., Bridgeport, British Columbia, which was destroyed by fire some time ago, has been rebuilt and placed in operation. Improvements and extensions are under way. The company is installing an open-hearth furnace and machinery to manufacture railroad and boat spikes, bolts, nuts, etc.

\*Chemist, Packard Motor Car Company, Detroit, Mich.



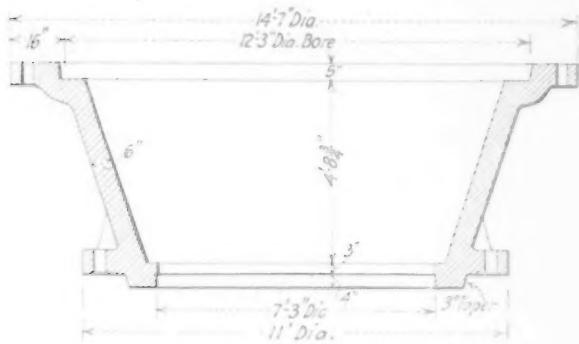
## MOLDING CRUSHER CASTINGS

### Some Large Sweep Molds at Hooven, Owens, Rentschler Works

The castings for one of the largest stone crushers ever built were recently completed by the Hooven, Owens, Rentschler Company, Hamilton, Ohio, for the Michigan Stone Company. Each of the three castings involved in the order weighed approximately 48 tons. Two of the castings were the top and bottom halves of the shell, while the third was for the spider of the crusher. The largest of the three castings had a maximum diameter of 17 ft. 6 in., and a height of 4 ft. 9 in. The molds for all three were swept up in loam, and while they presented no unusual complications from the foundry standpoint, their large size renders the methods used in molding of considerable interest.

Ordinarily castings of the character of these would be bedded in the floor. In the present case, however, a steel plate curbing was erected and the molds were built up on the floor. The spider casting requires but slight consideration, it being but a variation of ordinary fly-wheel molding. The arms were formed by means of cores and the rim was swept up in the usual way. The shell castings were more difficult.

The reproduction of the photograph and one of the drawings show the form and dimensions of one of the shell castings, and the sketch has been made to illustrate the method of molding. The base of the mold was first swept up, the sweep being constructed so as

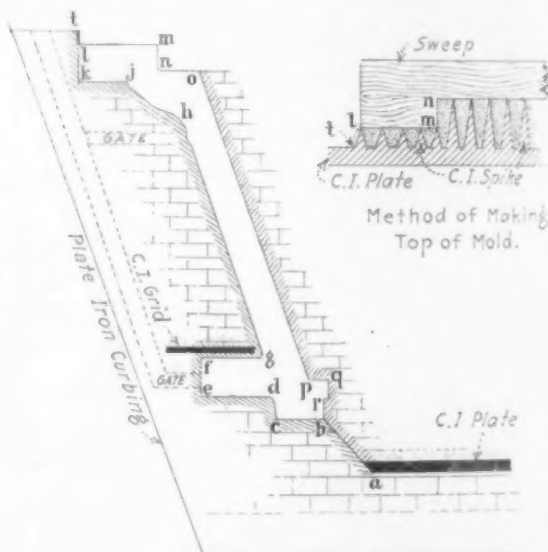


The Dimensions of One of the Large Castings

to form the surface  $a b c d e f$ . Upon this base the core was then built. A cast-iron plate was set in position as shown, and a sweep, the inner edge of which conformed to the surface  $o p q r b$  was used to form the exterior surface of the core. This surface comprised a thin facing of loam backed up by 8 in. of brick as shown, and supported on a cast-iron plate. Upon completion the core was removed, parting from the base on the line  $a b$ , and the mold proper was then swept.

The first sweep for making the base formed also the edge  $c b$  and also the surface of the flange  $e d$ . Another sweep was used to form the flange  $b e f g$ , while the remainder of the mold was formed by a sweep conforming to the outline  $t l k j h g$ . A cast-iron grid was set immediately above the loam facing forming the surface  $f g$  prior to making the upper portion of the mold. Four gates were used in the mold, the location of two of them being about as shown in the sketch. The remaining two were placed diametrically opposite. All four gates entered the mold tangentially, the iron flowing in the same direction through each gate, thus insuring a smooth entry and rapid filling of the mold.

The mold was closed by a cover plate built up, as shown in the insert sketch. The reference letters on this sketch correspond to the similar reference letters on the section of the mold in the main part of the illustration. The cast-iron plate, bearing on its face spikes of varying lengths as shown in the illustration, formed the basis of the cover plate. The spikes above the surface  $l m$  of the casting were made slightly shorter than the distance  $t l$  on the mold, while those above the surface  $n o$  were made somewhat longer. A sweep of the form  $l m n$  was then used and the space between the spikes filled with loam. But a single riser was used on each of the castings, this being located



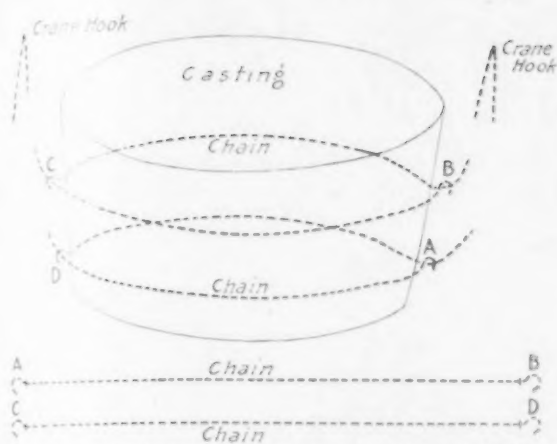
How the Parts of the Mold Were Made

on the upper flange  $l m$ . Both the mold and the core were dried by placing in them an ordinary salamander.

The holes in the several flanges of the castings were cored. It was required that these holes be located with a considerable degree of accuracy, as the holes in the several castings were required to match when the crusher was assembled. The holes at the extremities of the two diameters at right angles to each other of each flange were located by means of a template and the remaining holes between these four were then spaced by means of a jig. The brackets underneath the flanges were formed by setting wooden blocks in position between the holes when the mold was being built. After the mold was dried, these blocks were dug out, leaving a cavity of the proper shape and size in the mold.

A hard, close grain iron was used in pouring. The analysis is given as follows: Silicon, 0.80 per cent; phosphorus, 0.55 per cent; manganese, 0.75 per cent; and total carbon, 3.30.

The iron was drawn from two cupolas and run into a mixing runner above the mold. When this runner



Two Chains With Hooks at Each End Were Used in the Manner Indicated to Lift the Casting

was filled, the stoppers to the several gates in the mold were lifted, allowing the iron to enter the mold from the runner.

Due to the large size and sharp taper of the castings, they were somewhat difficult to handle. The problem was finally solved by the use of two cranes which lifted the castings by means of a "basket hitch." The basket hitch is somewhat unusual. It is formed by means of two chain slings with hooks at each end. These slings are roped around the casting as indicated in one of the sketches.

### Shop Pump Testing Plant

To test its turbine pumping machinery for efficiency as well as capacity, the Lea-Courtenay Company, Newark, N. J., has added to its factory equipment a testing rig capable of giving searching information of the performance of its productions beyond that sufficing for ordinary commercial requirements. The pump to be tested is driven by means of a steam turbine with a dynamometer between the source of power and the driven pump, and a Pitot tube, weir, Venturi meter, standardized nozzle or other device may be used to measure the quantity and head of the water pumped. The dynamometer gives a measure of the power input to the pump and the delivery pressure and quantity of water moved gives a measure of output. Thus the capacity of the pump is determined and also the efficiency.

The steam turbine driving the pump is a 500-hp.

non-condensing unit built especially for this plant. Its speed can be regulated and held constant at speeds of 800 to 3000 r.p.m. Steam is furnished by a 500-hp. torpedo-type boiler separate from the power plant of the shops and designed for a steam pressure of 250 lb. per sq. in. Oil is used for fuel, and it is understood, incidentally, that a working pressure of steam may be obtained from cold water in less than 30 min. The dynamometer is of the torsion type and measures the power transmitted by the amount of torsion of a square shaft.

The testing equipment is built over a concrete tank holding approximately 50,000 gal. of water. For measuring the water quantity, the Lea-Courtenay Company ordinarily uses a Pitot tube in connection with a 10-ft. mercury column. On small quantities of water tests are made by means of calibrated nozzles. These devices are checked as necessary by means of a Venturi meter or a weir.

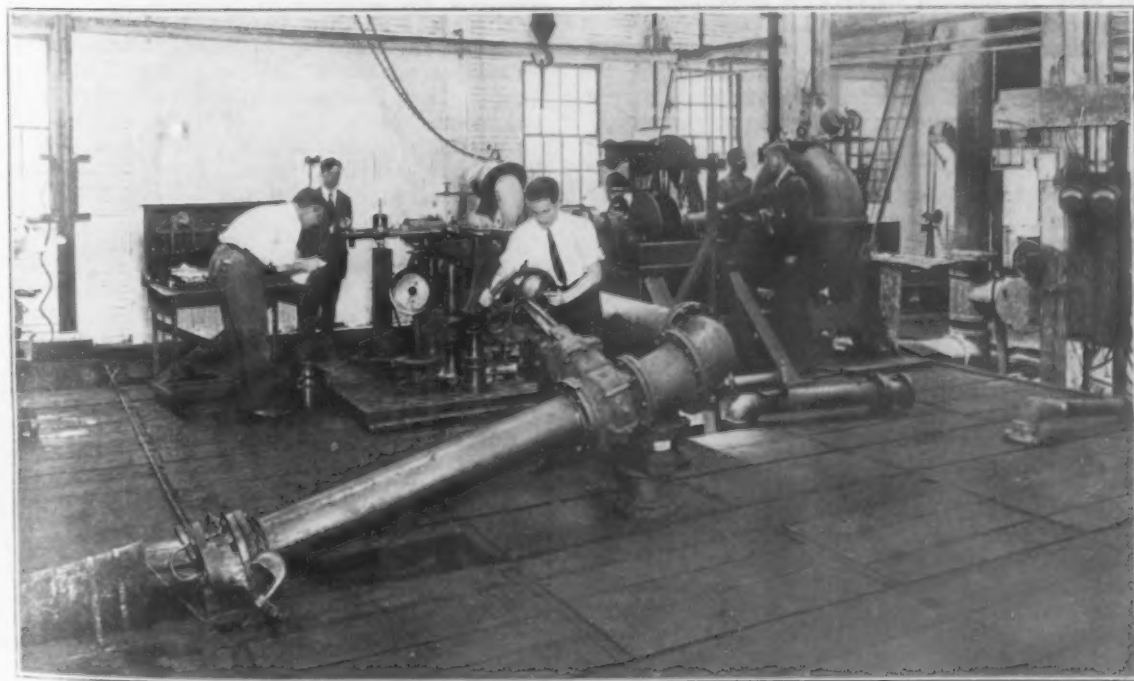
The company has also perfected an instrument known as a thrust meter, an instrument designed to tell how much and in what direction the end thrust of the pump may be. A scale gives the actual thrust in pounds, read directly from the instrument.

### Large Hydraulic Press Order

The Hydraulic Press Mfg. Company, Mount Giload, Ohio, has received an order for 70 hydraulic hot-plate presses of 115 tons rating. The order was placed by the Goodyear Tire & Rubber Company, Akron, Ohio. The presses, the first of which will be delivered at an early date, will be used for vulcanizing purposes. All of the presses are of one design and will be operated from the hydraulic pump and accumulator systems already installed.

The Monitor Controller Company, Baltimore, originator of a system of automatic control for motor-driven machinery, has moved to 500-516 East Lombard Street. The new factory is about twice the size of that formerly occupied, and extends on East Lombard Street from South Gay to Frederick. The lease on the old quarters has still some time to run, but it is necessary to provide increased facilities.

The Barnes & Kobert Mfg. Company, manufacturer of pressed-steel construction specialties, has changed its name to the B. & K. Mfg. Company. The executive and general offices are now located at the factory at New Britain, Conn.



Plant for Testing Pumps at Works of Lea-Courtenay Company, Newark, N. J.



# Deterioration of Refractory Materials\*

## Conditions Affecting Silica and Fire Brick in Open-Hearth Furnaces—Value of the Microscope in Fixing Quality—Bauxite and Other Brick

BY H. B. CRONSHAW

**D**URING the last ten years, and especially during the second half of this period, users of the best procurable firebricks have frequently directed attention to the inefficiency of the material. This is evidently an outcome of the rapid advances made in metallurgical operations, both as regards output, which means increase in the severity of working conditions, and because of the efforts which are continually being made to economize. Hence refractory materials have been called upon to cope with more and more exacting requirements, and at the same time it has become clearer to metallurgists that efforts ought to be made to decrease the great expense incurred in the installation and upkeep of furnace linings.

Both in America and Great Britain, it has been customary to regard the brick manufacturer as being entirely responsible for this state of affairs. Very probably this is actually true in a great number of cases where the brick manufacturer has failed to keep pace with metallurgical advances and properly to understand the requirements of the consumer. On the other hand, the latter has not, in many cases, been in a position definitely to state these requirements.

The first step toward supplying any particular furnace with a lining, etc., is to ascertain the chief destructive agents at work in every part of it. If these are known, the consumer will understand exactly what kinds of bricks are most suitable for the various parts of his furnaces. It then rests with the brick manufacturer to produce the required material.

It is now generally recognized that such factors as infusibility and chemical composition are not to be taken as the sole indications of the degree of refractoriness of a material, using the term in its broader sense, as indicating the ability to resist all forms of destruction, and not fusion alone. The old idea that a high content of silica was necessarily associated with high refractoriness is also practically dispelled, and it has come to be more clearly recognized that the refractoriness of a given material is not a function of one property alone, but depends on a number of factors which vary in relative importance according to the working conditions which prevail in the place it is used. Chemical analyses are, of course, very important, for, besides indicating the extent to which the material will resist destruction of a chemical nature, they supplement observations under the microscope.

### THE USE OF THE MICROSCOPE

Attention should be called to the possibilities underlying the use of the petrological microscope as an important accessory in determining whether a clay or quartz-rock is suitable for firebricks, and also for observing the changes which occur in a firebrick on burning. The chemical and physical properties of a clay, or any raw material used in brick-making, are determined by its mineralogical composition and texture; and if the latter could be conveniently and accurately estimated, they would no doubt constitute the most scientific basis for a classification. The various processes by which the mineralogical constitution of a clay is ascertained are particularly complex and tedious. On the other hand, practically the same results could be obtained by making use of a high-power microscope.

It would, of course, be impossible to adopt the ordinary methods of cutting thin sections in the case of clays in their plastic condition, but if they were burnt hard and soaked in Canada balsam, there ought to be no particular difficulty in obtaining sections thin

enough for examination. Possibly similar results would be obtained without burning, supposing the material to be warmed with the balsam and then carefully ground. It must be remembered, however, that some of the constituents of clays are in such a very fine state of subdivision that their detection is a matter of extreme difficulty, while in many cases it becomes almost impossible to effect a determination with any degree of confidence. On the other hand, quartzites, sandstones, grits, and other rocks which are used in brick manufacture can easily be cut into thin sections, and conveniently examined under the microscope. In this way a very good idea can be obtained of the amount of free quartz in the material, whether the grains are rounded, angular, or sub-angular, and how they are distributed in the material. Observations of this kind have a direct bearing on the technical value of brick-making materials.

In judging a particular clay as regards its suitability for firebricks, determination of the softening point is a matter of first importance. In this way Mellor has classified clays and shales, first of all, into two main groups—refractory clays which soften above 1500 deg., and non-refractory clays softening below this temperature. The determination of softening point is made under certain fixed conditions which take into account the rate at which the temperature rises.

A further use for the microscope is found in its application to the examination of firebricks, by both manufacturer and consumer. As in the case of the raw materials, the mineralogical composition can be qualitatively, and to some extent quantitatively determined, especially if supplemented by chemical analyses. Apart from this, it is also possible to see how much internal fusion has taken place in burning, and hence be in a position to form an opinion as to whether the bricks have received adequate treatment in this respect.

### OPEN-HEARTH FURNACES

With regard to a single furnace, the refractory materials are required to perform special functions which depend on their particular position in the furnace, and furthermore, they are subjected to various destructive agents of both a physical and chemical nature. It is these conditions which determine the various qualities and kinds of firebricks used in building up the body, blocks, and regenerators of any particular open-hearth furnace. Speaking in a general way, the arrangement of the refractory materials is very similar for all these furnaces.

In the case of furnaces working on the acid process, the roof, sides, and blocks are constructed of silica bricks, while the hearth is made up of a number of layers of fritted sand, resting on a stepped arrangement of silica bricks which constitutes the bottom of the furnace. The sand is banked up to the level of the doors. An inferior type of brick is often used for part of the blocks. The roof of an actual example was 9 in. in thickness, the sides 18 in., while the bottom consisted of 6 in. of silica bricks and 15 in. of fritted sand.

Furnaces of this type, without slag-pockets, usually run about 16 weeks, or 144 heats, before being stopped for serious repairs or partial rebuilding, which may consist in the erection of a new roof and sides. If, however, slag-pockets are attached, which is always the case in modern furnaces, the length of life is increased to 22 weeks, or about 198 heats. In more favorable instances, however, the roof may last double this time if skilfully repaired. The bottom lasts several years before it re-

\*From a paper which was granted a Carnegie Scholarship memoir by the Iron and Steel Institute in May, 1916.

quires rebuilding. Apparently better results are obtained in America, for, according to Stoughton, an acid furnace will survive as many as 1000 heats.

In basic furnaces in the course of about 15 weeks the roof, which was originally 12 in. in thickness, is worn down to about 4 in. The bottoms are said to have a lifetime of from 7 to 9 years. On the authority of F. T. Havard, it would be considered very satisfactory in American practice if a furnace survived 350 heats, corresponding to from 18 to 24 weeks.

Several methods have been used for detailed construction of the hearth. At one time the hearth was built up entirely of basic bricks. This, however, was not a success. Another method consisted in first ramming the bottom with crushed dolomite and tar, and then drying the whole gradually prior to subjecting it to higher temperatures. In this case also the results were not satisfactory. The best results are obtained when the basic material is fitted on in layers in a way similar to that employed in acid furnaces. The bottom itself may consist of silica and magnesia bricks. The latter give the best results, but are more expensive. According to Harbord, the hearths in some of the American furnaces are built up first with a course of firebricks, followed by magnesia bricks, and then the usual layers of fritted basic material.

#### BRICKS FOR THE BLOCKS

The arrangement of bricks in the blocks and regenerators is very much the same for both acid and basic furnaces. Various forms of blocks appear to have been tried, but the present tendency seems to be toward a reduction in size. Very often somewhat inferior bricks are used for certain parts, but it is questionable whether any advantage is gained by doing so. On the other hand, in the case of modern Talbot furnaces the more expensive magnesia bricks are built into the gas ports. As regards the regenerators, ganister bricks appear to find general use for the checkerwork. The lifetime usually assigned to regenerators attached to large Talbot furnaces is about 18 months for the gas chambers, and 12 months in the case of the air chambers. At the end of this time the checkerwork has to be rebuilt.

The destructive effects are to be traced to a variety of agencies, which assist one another in their work. This can easily be realized by examining the interior of an abandoned furnace. The surface of the roof has been worn away in an irregular manner, leaving hollows and grooves. The sides and walls are glazed, and the bricks are darkened. The latter have apparently undergone considerable changes in texture, and to some extent in composition. Furthermore, portions of the refractory lining have cracked, or even broken away.

#### BODY OF THE FURNACE

*Abrasion.*—Examination of the interior of the body of a furnace after 14 to 18 weeks, shows that erosion of the roof has taken place, not uniformly over the whole surface, but irregularly, so as to leave furrows, hollows, and crevices. The most pronounced effects occur in the central portions, usually including an area about 6 ft. square situated above the middle door. At either end well-marked furrows spread out fanlike from the air port. Another example of localized destruction is to be found in the peculiar form assumed by the roof of an open-hearth furnace, having its two air ports situated at the upper corners. Here denudation proceeds most rapidly along either side of the roof, so as to form two long hollows separated by a broad ridge. These peculiarities can be best ascribed to the abrasive action of fine dust swept through the furnace by the producer-gas. A continuous bombardment of the roof by innumerable particles of flue-dust must constitute an effective means of destruction.

*Volume Changes.*—When a body of firebrick is subjected to temperature variations, it generally undergoes a corresponding change in volume. These temperature fluctuations arise from a number of causes—when the lining receives its first heat, or when the gas is cut off for the usual week-end repairs. Rapid changes in temperature of a local character also occur when the

doors are opened, and cold material charged into the furnace. There are numerous cases where neglect to apply precautions has resulted in the rapid collapse of the lining.

The second result of temperature variation are strains and differential movements within the bricks themselves. Fragments of bricks may drop from the roof and sides, and cracks may be produced, offering access to fluxing agents, such as vapors, fine particles of dust, and molten slag, or, in the case of the hearth, of molten metal, which exerts a very effective disruptive force.

*Heat and Fluxes.*—These act conjointly; the independent efforts of either would, relatively speaking, produce slight results. Most furnaces are equipped with linings made from materials which soften at temperatures higher than those under working conditions, that is, providing the material is not directly exposed to the full play of the flame. How important the latter consideration may become is shown by the rapid erosion of roofs in the earlier forms of open-hearth furnace. They were built with a depression in the middle, and thus came under the direct influence of the flame.

#### TEMPERATURES INSIDE OPEN-HEARTH FURNACES

There appears to be no really reliable information concerning the temperatures in different parts of the furnace. Le Chatelier estimates the temperature of gas entering the body from the regenerators as 1200 deg. C., and the air as 1000 deg. C. As a result of a large number of observations made on the gas passing from the regenerators into the body of a 150-ton Talbot furnace, the temperature may be regarded as varying between 1000 and 1200 deg. C. The temperature of the flame must therefore rise considerably above this, and hence the importance of preventing the flames from impinging on the brickwork. It would be interesting to make direct measurements of the temperatures attained by the inner surface of roof and walls, particularly the roof. Experienced chemists estimate it as being something like 1500 deg. C. If so, this is rather dangerously near the softening point of silica bricks. Kanolt gives 1700 to 1750 deg. C. as the softening point of silica bricks, the determination having been made on three samples. A magnesia brick, on the other hand, is recorded as softening at 2165 deg. C.

Simple examination of bricks taken from the roofs of abandoned furnaces is not sufficient to determine whether the temperature alone was high enough to fuse the exposed faces, because the effects are completely masked by the interference of fluxes. They do not soften to any appreciable extent, as they preserve their form in spite of considerable pressure. Microscopic examination, however, makes it clear that the surface of the roof is exposed to temperatures well under the melting point of quartz. Certain changes do take place which are the outcome of protracted exposure to high temperature alone.

Fig. 1 is a photograph of a high class silica brick taken from the central portion of the roof of a 150-ton Talbot furnace after a period of 18 weeks. Its original length was 12 in., which has been reduced in reproduction. For convenience of description, it has been divided into four portions—A, B, C and D. The portion A is next to the exposed surface of the brick, and consists of a light grey band about 1 in. wide. The outer surface is fused, but the thickness of slag is very small, and sharply marked off from the interior. Next to this comes the portion B, about 2 in. wide, which is similar in texture to A, but differs remarkably in color, being practically black, relieved by a few pieces of white grog. This grades more or less sharply into the section C, which is dark olive green and crowded with angular pieces of grog. Lastly, there is a narrow strip of comparatively unaltered material. Sections taken from these various parts and examined under the microscope revealed a series of very interesting changes.

*Workmanship.*—It is important that the bricks in every part of the lining be set close together, with the object of making the joints as narrow as possible. In certain places this is not possible, because room for expansion of the masonry must be allowed for. The joints



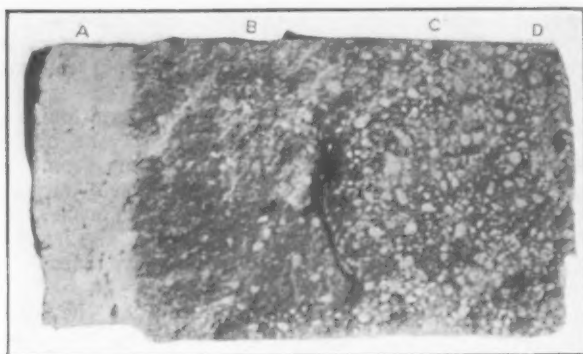


Fig. 1—Silica Brick Taken from the Central Part of the Roof of a 150-Ton Talbot Furnace After 18 Weeks. It has Been Reduced Here About One-Half

will form lines of greatest weakness, so that the narrower they are the better. The roof of an abandoned furnace clearly shows this. In the walls, and in many places in the roof, shallow fissures mark the joints, and the surfaces have a kind of embossed appearance. Actual observation shows that far too much mortar is used. To a large extent this is due not so much to defective workmanship, as to the fact that even the best bricks show remarkable variations in size and form.

#### THE PORT-BLOCKS

The brickwork in the port-blocks suffers under influences which are similar to those obtaining in the body of the furnace, though somewhat modified. Denudation is particularly intense at the ports, and is by no means eliminated by use of water-cooled tubes. In other parts the temperature is not so high, probably in the neighborhood of 1100 deg. C.; although, on the other hand, the action of the dust must be rendered more intense on account of its being confined in less space. In any case, the surface of the bricks is fluxed, as can easily be seen by looking into the flues soon after the gas is cut off and the blocks drawn back.

Fig. 2 shows a portion of a brick taken from the air flue of a large Talbot furnace. A section taken at the fused surface showed, when examined under the microscope, well-formed crystals of secondary quartz embedded in a yellowish glass. The pieces of grog had been converted into an isotropic glass, which was somewhat clouded owing to the presence of fine inclusions. Another section, taken from a silica brick which had been built into the block of a basic open-hearth furnace, showed the same general features, with the exception that the glass in the groundmass was crowded with skeleton crystals of magnetite.

#### THE REGENERATORS

The chief troubles in the regenerators are undoubt-

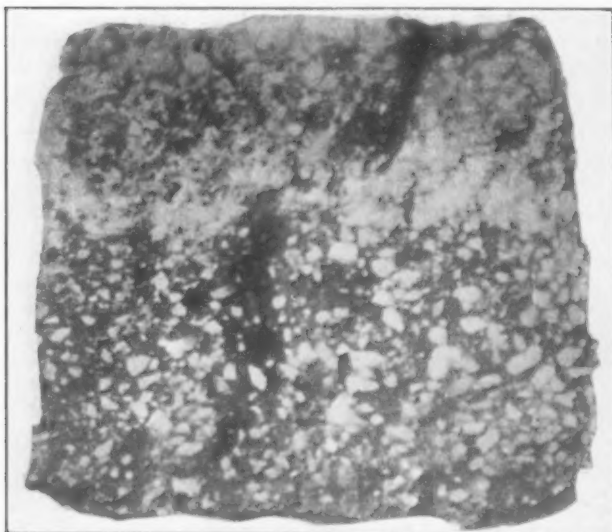


Fig. 2—Portion of a Brick Taken from the Air Flue of a Large Talbot Furnace

edly due to the slagging effects of dust. The results of this are particularly serious. Undesirable effects begin to appear very soon after the checkers have been built up. For instance, the regenerators attached to a 150-ton Talbot furnace had to be opened for inspection and general cleaning only 14½ weeks after the checkerwork had been erected. On this occasion the upper surfaces of the bricks were thickly covered with a chocolate-brown dust, which had fused at its contact with the bricks. This gave rise to a dark-colored, viscous slag, which had run over the sides of the bricks, and collected into stalactites on their under surfaces. Thus when the regenerators are in use this slag must drip through the checkerwork from brick to brick.

Generally speaking, the bricks themselves had retained their form, and were not noticeably reduced in size. A certain number were fractured, and had to be removed, but the majority seemed to be fairly sound. In the air-chambers there appeared to be more slag, and the evidences of destruction were more noticeable. The internal structure of the bricks had not undergone any marked change. The central portions were yellowish while the outer portions were bleached, and to some extent fused, but textural changes had not progressed very far into the interior. Within the gas-chamber the same general features obtained.

In the case of a set of regenerators of a small basic open-hearth furnace provided with slag-pockets, the fluxing process had proceeded to a very advanced stage. The bricks in the air-chamber had been in use for about a year, while in the gas-chamber they had run for a period of two years. Most of them were very considerably reduced in size. The upper surfaces were somewhat depressed in the middle, with numerous holes reaching into the interior. In many instances the whole of the bricks had been reduced to a partly fused and stone-like condition. Thus, unlike the case of the roof bricks, the slag which collects in the hollowed surfaces of these checker bricks gradually works its way into their interior.

The gas-chambers in a large steelworks where Talbot furnaces were being used were allowed to run for 18 months, and the air-chambers for 12 months, before being completely rebuilt. In another instance, where basic open-hearth furnaces were in use, the gas and air chambers survived 24 and 12 months respectively, while for a particular set of acid open-hearth furnaces both pairs of chambers were only allowed to run for 40 weeks. In all these examples slag-pockets were provided, and ganister bricks were used in the checkers.

The following set of analyses throws additional light on the details involved in the process:

	A,	B,	C,	D,	E,
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
SiO <sub>2</sub> .....	59.80	86.34	83.62	12.70	30.5
Al <sub>2</sub> O <sub>3</sub> .....	5.50	7.98	10.97	60.70	15.8
Fe <sub>2</sub> O <sub>3</sub> .....	20.57	2.68	4.73	26.30	28.2
CaO.....	11.90	Trace	Trace	2.19	4.1
MgO.....	Trace	0.16	0.16	---	0.6
Ignition loss..	---	---	---	---	10.2
					K <sub>2</sub> O 1.9
					Na <sub>2</sub> O 1.2
					SO <sub>2</sub> 5.8
					TiO <sub>2</sub> 1.1

A. Partial analysis of slag taken from the slag-pocket of the furnace mentioned under B and C.

B. Partial analysis of the interior of a checker brick taken, after two years' use, from the gas-chamber of a small basic Siemens furnace.

C. Analysis of the surface portions of the same brick.

D. Analysis of checker dust taken after 14½ weeks from the gas-chamber of a large Talbot furnace.

E. Analysis of producer fuel ash given by Dr. Mellor.

A consideration of analysis D makes it clear that the dust which collects among the checkerwork is very rich in ferric oxide and lime, and also contains a surprisingly large amount of magnesia. Comparing this with the analysis given by Dr. Mellor, it becomes evident that a large portion of the oxide of iron, and practically all the lime, must come from the materials charged into the furnace. The small amount of magnesia may be assumed to have its origin in the mag-



nesia limestone, or dolomite, which is thrown into the furnaces while repairs to the hearth are being carried out. Magnesia, whatever its origin, materially assists the fluxing action of the iron and lime.

The slag (analysis A) is remarkable for its relatively high content of silica. From this and other considerations it seems reasonable to infer that it represents drops of slag from the roof, particles of slag which are shot up during the periods of violent ebullition which occasionally occur in the slag bath, small pieces of brick which fall from the roof, and the products of fluxing which goes on in the block and slag-chamber itself. Further, it is very probable that the slag-pocket serves to retain only a very small fraction of the dust.

#### GENERAL CONCLUSIONS

Taking the body first, and, in particular, the most vulnerable part of it, the roof, practically all the erosion which occurs can be attributed to the effects of abrasion, volume changes, and the conjoint influence of heat and fluxes. Assuming that the flame is not allowed to impinge directly on the roof, and that the masonry has been well carried out with bricks of uniform size, there seems no reason to doubt that the combined action of heat and fluxes takes by far the greatest share in the process of wear and tear, which is therefore, for the most part, of a chemical nature.

The principal source of trouble is the dust, which is derived partly from the producers, and partly from the charges. It consists chiefly of oxide or iron and lime, and consequently the roof, being built up of quartzose material, is readily attacked, and is eaten away far more rapidly than the basic walls. As pointed out above, the degree of porosity does not influence the rate at which fluxing proceeds as much as it would otherwise do, supposing the slag were allowed to accumulate on the surface of the bricks. As soon as the slag has reached a condition of suitable fluidity, the strong draught through the furnace sweeps it away, and at the same time exposes fresh surfaces for attack by the constantly replenished supplies of fluxing material.

The influence of volume changes probably comes next in relative importance. Large cracks and general disintegration of the lining can, to some extent, be obviated by proper attention to the tie-rods, as well as a careful regulation of the rate at which the furnace is heated or cooled, particularly for the first heat. The small cracks which develop within the bricks themselves prove, in most cases, a source of considerable danger by accelerating the fluxing processes. The trouble is, ever, not so serious in the case of the roof, as the slag cannot collect in sufficient quantity to penetrate the cracks. Indeed, the exposed surfaces are remarkable for their smoothness, and freedom from holes and crevices.

The extent to which abrasive action contributes toward the general destruction is difficult to estimate, but when considered along with the more obvious influence of heat and fluxes, its importance is not very great. This is made additionally clear by the fact that erosion proceeds most rapidly in the central portions of the roof where the influence of abrasion is least felt.

The natural way out of these difficulties is therefore to be found either in suppressing the dust or using a chemically inactive material for the roof, which would, in this case, have to be basic in character. The bricks should have as small a porosity as possible without increasing their susceptibility to temperature changes. This also applies to the upper part of the side walls, and to both acid and basic furnaces.

The important part played by the fluxing action of dust has been pointed out in the discussion on regenerators. Here the trouble is chiefly chemical. Abrasive action can come into play in only a very limited sense; while, on the other hand, the degree of porosity of the checker bricks, and their ability to withstand changes of temperature, become important.

In considering the possible ways which might be adopted to insure even a partial elimination of these effects, several methods suggest themselves, all of which must involve considerable practical difficulties, which,

however, do not appear altogether impossible of solution. For example, some means of suppressing the dust might be devised. Even partial success in this direction would produce very satisfactory results. The first step has been taken by making use of slag-pockets, although these can only be regarded as retaining a very small fraction of the dust which comes through the furnace. It seems quite possible that some method could be found either for preventing a large portion of the dust from entering the checkerwork, or else for removing the dust as it settles on the bricks. Another possible way out of the difficulty consists in replacing the acid bricks of the checkerwork by basic ones. Magnesia bricks are expensive, and in many cases are liable to shrink a great deal.

#### BAUXITE AND OTHER BRICK

There are a number of other basic materials, having an advantage as to expense, which might furnish very suitable bricks at the cost of a certain amount of research. Bauxite, serpentine, steatite, lime, dolomite, and magnesian limestone may be instanced. Bauxite bricks have proved rather troublesome because of their tendency to shrink, but there is no reason why this weakness should not be overcome by burning at a sufficiently high temperature, and by suitably arranging the texture and composition. The chief difficulty in the case of lime lies in the rapidity with which it absorbs moisture. On the other hand, lime which has been fused in, for instance, an electric furnace, is said to resist water very well. Dolomite and magnesian limestone would seem to be exceptionally good materials to experiment with. Magnesia bricks appear to have proved quite a success for the walls and bottom. They are, however, somewhat expensive, and very often shrink a great deal, with the result that the joints are widened and portions of the brick break away.

Another suggestion involves the use of ganister, or good firebricks of minimum porosity, combined with a maximum resistibility against temperature fluctuations. But so long as the bricks are of an acid nature, fluxing will still go on, however dense and free from cracks they are. Furthermore, there will still be difficulties to overcome, which arise out of the dust accumulating in the checkerwork.

#### Exports of Zinc Exceed Records

Zinc exports from the United States, while not quite as large as they were for a few months late in 1914 and early in 1915, are still of extraordinary proportions and exceed previous records. Based on the monthly rate of 12,182 gross tons to Sept. 1, 1916, the outgo of zinc as pigs, bars, plates and sheets is at the rate of 146,184 gross tons per year. The following table compiled from Government data shows comparative exports:

Period	Total, Gross Tons	Per Month, Gross Tons
To Sept. 1, 1916 (eight months)...	97,458	12,182
Fiscal year ended June 30, 1916..	124,564	10,380
Fiscal year ended June 30, 1915..	115,482	9,623
Fiscal year ended June 30, 1914..	1,783	148
Calendar year, 1915.....	111,788	9,315
Calendar year, 1914.....	57,899	4,825
Calendar year, 1913.....	6,948	579

The exports in July and August, 1916, were 15,371 and 14,439 tons respectively, and if maintained at this rate the total will be 178,860 tons for one year. The exports in 1916 have varied between 7808 tons in March and 15,371 tons in July. The largest war month was 17,005 tons in September, 1914, with 16,354 tons in December of the same year.

The merchant mill of the Pittsburgh Crucible Steel Company, Midland, Pa., broke all records Oct. 26 by rolling 543 tons of high carbon steel rounds in 12 hours. During this period the sections were changed three times. The actual rolling time was 11 hours and 30 minutes. During this record there were times when 199 billets were rolled in one hour and the turn was finished by making an average of 175 5/12 billets per hour.

# Cruisers Require Larger Appropriations

Government Must Assume Advances  
in Materials—French Submarine Pro-  
posal—Reasonable Armor Plate Bids

WASHINGTON, D. C., Nov. 7, 1916.—A grave situation confronts the Navy Department as the result of bids opened Nov. 1 for four scout cruisers and 29 submarines. While contracts for the submarines may easily be let on the basis of the proposals submitted, but one bid within the statutory cost limit and that for a single vessel was tendered for the scout cruisers. The department is thus obliged to face the alternative of reducing the efficiency of the vessels by radical changes in structure and motive power, or of going to Congress for an increased appropriation roughly estimated at 10 per cent. The fact that only one shipyard offered to build a cruiser on acceptable terms and that other leading yards declared their inability to compete at all or offered to take contracts only upon condition that the Government would assume the risk of advance in material and labor foreshadows further embarrassment to the department when proposals for the battle cruisers are opened next month. The possibility that a large part of the naval program, which was fought through Congress with such a tremendous expenditure of energy on the part of the friends of an adequate navy, may require to be referred back to the House and Senate for additional appropriations has filled the naval experts with dismay, especially in view of intimations already current here that much difficulty is certain to be encountered in securing at the coming session the money morally pledged at the last session for the remainder of the construction program not yet appropriated for.

Bids were also received Nov. 1 for upward of 45,000 tons of armor for the battleships and battle cruisers recently authorized, the Bethlehem, Carnegie and Midvale companies submitting figures that are generally regarded as very reasonable, especially in view of existing conditions in the steel market. The slight differences between the three proposals, while to be expected because of the exhaustive investigation of armor plate costs during the past year, will serve to test the sincerity of the Secretary of the Navy, who has so often roundly abused his predecessors for dividing armor contracts among the existing manufacturers. The comparatively low bids now offered by the three plants will also emphasize the folly of an attempt on the part of the Government to build and operate an armor factory which could hardly be regarded as more than an experiment for several years to come.

## THE SCOUT CRUISERS A PROBLEM

The four scout cruisers included in the naval program undoubtedly present a serious problem to the shipbuilders of the country because of their enormous power requirements which must be guaranteed to develop a speed of 35 knots per hour. In fixing a limit of \$5,000,000 each for these ships the committees of Congress figured more closely than on any other class of vessels authorized. The result is that only one shipyard, that of the Seattle Construction & Drydock Company, made an unconditional bid for one of these vessels, the price being \$4,975,000. The Fore River Shipbuilding Corporation, Quincy, Mass., offered to build two vessels for \$4,900,000 each on the basis of present costs, the Government to assume the risk of any increase that may occur before the vessels are finished. This concern also proposed to build a ship on a basis of cost plus a profit of 15 per cent. The Union Iron Works, San Francisco, duplicated the proposal of the Fore River Company as to building on a basis of cost plus 15 per cent and offered to take two vessels on these terms. The bids for the scout cruisers Nos. 4 to 7 were as follows:

## BIDS FOR SCOUT CRUISERS NOS. 4 TO 7

Class 1—Department's design.

Class 2—Hull and equipment of department's design, machinery of bidder's design.

*Seattle Construction & Dry Dock Company*

Class 1, 90,000 hp.:

1 vessel, 30 months.....\$4,975,000  
Time based on 8-hour workday.

*Fore River Shipbuilding Corporation*

Proposal A.

Class 1, 7100 tons trial displacement, 90,000 shaft hp.:

2 vessels, 33 and 36 months each.....\$4,900,000

This proposal contemplates assumption by Government of risks of increased cost of labor and material. Certain conditions enumerated.

Proposal B.

Contemplates construction of vessel on basis of actual construction cost plus profit of 15 per cent, subject to certain enumerated conditions. If this company is awarded contract for battleships or battle cruisers, it will not accept award for any scout cruisers.

*Union Iron Works*

Two vessels in accordance with plans, data sheets, etc., submitted by Fore River Shipbuilding Corporation on basis of actual cost of construction plus a profit of 15 per cent. Certain conditions enumerated.

## COMPETITION FOR SUBMARINES

The construction of submarines has now progressed to a point where both hulls and power plants are practically standardized, and because of the relatively small size of these vessels it is unlikely that the Government will ever have any difficulty in securing as many as Congress can be induced to provide for. For the two 800-ton fleet submarines Nos. 105 and 106, the Electric Boat Company, New York, the lowest bidder, submitted alternative bids for both vessels well within the limit, while the Lake Torpedo Boat Company, Bridgeport, Conn., offered to build one vessel within the limit, or to license the Navy Department to build one or two for \$100 per ton of submerged displacement, or approximately \$80,000 each. These bids were as follows:

*Electric Boat Company*

Design 73-AA, 850 tons, 26 months, works of Fore River Shipbuilding Corporation, Quincy, Mass., department's plans and specifications and contract form B.

1 vessel.....\$1,165,000

2 vessels, 26 and 27 months, each.....1,145,000

Design 73-A, 850 tons, works of Fore River Shipbuilding Corporation, Quincy, Mass., department's plans and specifications and contract form C.

1 vessel, 26 months.....\$1,189,000

2 vessels, 26 and 27 months, each.....1,167,000

*Lake Torpedo Company*

One vessel, built at Bridgeport, in general accordance with department's outline specifications, modified as shown in altered copy and with plans, data, etc., submitted herewith, 16 knots surface speed, 11 knots submerged speed.

Design 30-a.....\$1,195,000

Time 24 months if awarded in combination with coast defense boat contracts type 24-M1; and 27 months if awarded in combination with types 31-A or 31-B; modified form of contract attached.

Will license department to build at navy yards for \$100 per ton of net design submerged displacement.

There was plenty of competition for the 27 coast defense submarines Nos. 78 to 104, making it certain that all of these vessels can be built by private contract. The Electric Boat Company submitted no less than eight separate proposals covering 24 boats. Four alternative designs submitted by this company were offered within the department's limit of \$700,000, but a stipulation was included requiring a minimum construction period of 22 months. To bring this time down to 15 months, as desired by the department, this



company stated that it would be necessary to exceed the cost limit, but even the maximum figures for early deliveries may be accepted under the provision of the naval appropriation act, authorizing a 20 per cent increase in cost to insure speedy deliveries. The Lake Torpedo Boat Company submitted proposals for from six to ten vessels within the limit of cost, but the designs are for a smaller type of boat than those estimated for in the Electric Boat Company's proposals. Bids were also received from the California Shipbuilding Company of Long Beach, Cal., conditioned upon the awarding of contracts for boats of the same design to its licensor, the Lake Torpedo Boat Company, the terms of both companies to be the same.

#### FRENCH OFFER OF SUBMARINE LICENSE

A novelty in this class of bids was the proposal submitted by the well-known French concern, Schneider & Co., which proposed to license the Navy Department to build vessels under its designs and patents. Estimates of the cost of constructing these vessels in France prior to the war submitted by this company brought their cost on this basis in close competition with the American yards, but allowing for the great increase in both material and labor that has since taken place and the difference between French and American costs on both items, figures are obtained above those of any other bidder. Following are the proposals for coast defense submarines:

BIDS FOR COAST DEFENSE SUBMARINES NOS. 78 TO 104  
Class 1—Department's specifications and bidder's design.  
Class 2—Department's specifications modified and bidder's design.

#### Electric Boat Company

- Bid 1—Design 77-A, 570 tons, class 2, contract form A.  
24 or more boats, at Fore River Shipbuilding Corporation's works at Quincy, Mass., or Union Iron Works, San Francisco or Alameda, Cal., 1 in 18 months, 2 every month thereafter up to and including 22nd month, and 3 every month thereafter, 10 delivered on Pacific coast, remainder on Atlantic, each.....\$835,400  
And license department to build 3 boats at navy yards exclusive of engines, each..... 50,000  
Including engines, each..... 62,500
- Bid 2—Design 77-AA, 570 tons, class 2, contract form A.  
24 or more boats, same time and place of delivery as in bid 1, each.....\$823,400  
Same license agreements as bid 1.
- Bid 3—Design 68-C, 530 tons, class 2, contract form A.  
24 or more boats, constructed as stated in bid 1, 1 in 15 months, 2 every month thereafter up to and including 25th month, and 3 every month thereafter, 10 delivered on Pacific coast, remainder on Atlantic, each...\$812,400  
Same license agreement as bid 1.
- Bid 4—Design 68-CA, 530 tons, class 2, contract form A.  
24 or more boats, same deliveries as bid 3, each...\$803,400  
Same license agreements as bid 1.
- Bid 5—Design 77-A, 570 tons, class 2, contract form B.  
24 or more boats, constructed as stated in Bid 1, 1 in 25 months and 2 per month thereafter, 10 delivered on Pacific coast, remainder on Atlantic, each....\$697,000  
Same license agreement as bid 1.
- Bid 6—Design 77-AA, 570 tons, class 2, contract form B.  
24 or more boats, same deliveries as bid 5, each...\$685,000  
Same license agreement as bid 1.
- Bid 7—Design 68-C, 530 tons, class 2, contract form B.  
24 or more boats, constructed as stated in bid 1, 1 in 22 months and 2 per month thereafter, 10 delivered on Pacific coast, remainder on Atlantic, each.....\$677,000  
Same license agreement as Bid 1.
- Bid 8—Design 68-CA, 530 tons, class 2, contract form B.  
24 or more boats, same deliveries as bid 7, each...\$668,000  
Same license agreement as bid 1.

#### Lake Torpedo Boat Company

- Bid 1—Class 2A, 495 tons, New York Yard delivery.  
Not less than 6 or more than 10 boats, 14 knots surface speed, 11 knots submerged speed, 1 in 22 months, successive boats at intervals of 3 weeks thereafter.  
Design 31-A, each .....\$694,000  
Design 31-B, each ..... 692,000  
And license department to construct boats at navy yards under said designs, contract form similar to L-8, furnishing duplicate plans, etc., for \$100 per ton of net design submerged displacement.
- Bid 2—Class 2, 485 tons, New York Yard delivery.  
Not less than 6 or more than 10 boats, same speed as bid 1, first boat in 21 months, successive boats at intervals of 3 weeks thereafter.  
Design 24-M1, each.....\$689,000  
Same license agreement as bid 1.

#### California Shipbuilding Company

- Bid 1—Class 2A, 495 tons, delivery at Mare Island Yard.  
Not less than 5 or more than 6 boats, 14 knots surface speed, 11 knots submerged speed, of Lake Torpedo Boat Company's design, first boat in 23 months, successive boats at intervals of 3 weeks thereafter.  
Design 31-A, each .....\$698,000  
Design 31-B, each ..... 696,000  
Conditional on award of contracts for boats of same design to its licensor, Lake Torpedo Boat Company, terms of contracts of both companies to be the same.
- Bid 2—Class 2A, 485 tons, delivery at Mare Island Yard.  
Not less than 5 or more than 6 boats, same speed, etc., as bid 1, 1 in 22 months, successive boats at intervals of 3 weeks thereafter.  
Design 24-M1, each.....\$693,000  
Same conditions as bid 1.

#### Schneider & Co.

- 42 rue d'Anjou, Paris, France; 44 Whitehall Street, New York, represented by W. Collin.
- Type F, project A, license department to construct at navy yards, 1 or more boats, furnishing plans and specifications, general arrangement plan No. 766.  
For first vessel ..... \$68,000  
For each succeeding vessel..... 38,000  
Estimated cost of construction in France before the war, each .....\$585,000
- Type F, project B, plan No. 767, first vessel..... \$57,000  
For each succeeding vessel..... 33,000  
Estimated cost of construction in France before the war, each .....\$500,000
- Type F, project C, plan No. 768, first vessel..... \$70,000  
For each succeeding vessel..... 40,000  
Estimated cost of construction in France before the war, each .....\$598,000

#### MODERATE PRICES ON ARMOR PLATE

Great interest attaches to the bids for armor because of the long-pending controversy on this subject and the authorization by Congress of a Government factory. On Class A-1 armor, including heavy side armor, which constitutes the great bulk of the protection for the four battleships and four battle cruisers authorized by Congress, the Bethlehem Steel Company for battleship armor bid \$420, the Carnegie Steel Company \$425 and the Midvale Steel & Ordnance Company \$427, while for the plates for the battle cruisers the three companies bid \$435, \$425 and \$440, respectively. On Class A-2 turret armor, the bids ranged from \$485 to \$496 per ton, while on Class B, thin plates, the range was from \$460 to \$466 per ton. Following are the bids in detail:

#### BIDS ON ARMOR PLATE FOR FOUR BATTLESHIPS AND FOUR BATTLE CRUISERS

	Class A-1		Class A-2		Class B	
	Per Ton	Tons	Per Ton	Tons	Per Ton	Tons
Bethlehem Steel Co.:						
Two battleships.....	\$420	14,479	\$485	820	\$466	602
Two battle cruisers.....	435	6,086	485	336	466	288
Carnegie Steel Co.:						
Two battleships.....	425	14,479	486	820	460	602
One battle cruiser....	425	3,043	486	168	460	144
Midvale Steel & Ordnance Co.:						
One battleship.....	427	7,500	496	450	466	325
One battle cruiser....	440	3,200	496	200	466	150

While the Midvale Steel & Ordnance Company bid \$385 per ton for 90 tons of steel bolts and nuts, the Bethlehem Steel Company bid \$395 per ton for 173.4 tons and the Pittsburgh Screw & Bolt Company bid \$548.80 per ton for 173.4 tons. The Bethlehem Steel Company also bid \$785 per ton for 6.6 tons of bronze bolts and nuts, while the Pittsburgh Screw & Bolt Company bid \$2240 per ton for the same quantity.

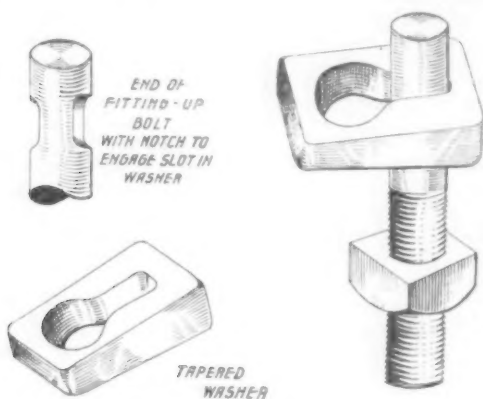
W. L. C.

Pennsylvania's industrial fatalities in September were 245, while 21,949 other employees received injuries that disabled them for periods of more than two days. The daily average of injuries was 888. In the first nine months of this year 188,278 industrial employees in Pennsylvania were injured while at work—a monthly average of 20,717—and of that number 1827, or a monthly average of 203, died as a result of their injuries. These figures were made public Oct. 21 by John Price Jackson, commissioner of the Department of Labor and Industry.



### Fitting-up Bolt with Taper Washer

Donald Gay, Newport News, Va., has developed a new type of fitting-up bolt. It is intended for use wherever two pieces of steel are to be fastened together



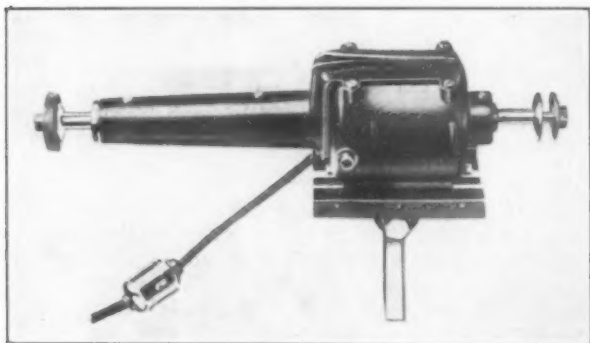
The Taper Washer May Be Quickly Knocked Out in Unbolting and the Threaded Portion Is Protected

and have holes through which the bolt can be passed to hold them in position while permanent connections are made. The particular advantages claimed for the bolt are a saving of time in unbolting and a saving in the number of bolts that have to be used for the purpose, due to the fact that the threads are protected against injury.

As will be noted the device consists of three parts, a tapered washer with a special form of slot, the bolt and the nut. The bolt is slipped through the holes and the washer passed over the end so that the slot near the end of the bolt engages with the narrow portion of the slot in the washer. The nut on the threaded end is then turned as much as may be necessary to hold the two pieces closely together. When it is desired to remove the bolt the washer is simply knocked off, which is accomplished in a much shorter space of time than is required to unscrew the nut. The threads on the bolt, it is pointed out, are not injured as it is the unthreaded end which passes through the holes in place of the threaded one as ordinarily would be the case, and where the holes are not smooth, the threads are frequently damaged by roughness either at the edges or in the center of the material. It is also emphasized that the nut is kept on the bolt at all times, which further serves to protect the threads from injury where the bolt drops through the staging to the ground and also in the interval while it remains there before being recovered.

### Extension Arm for Internal Grinding

To enable its portable toolpost grinding machine to be used for deep internal work, the Wisconsin Electric Company, Racine, Wis., has developed an extension arm which is supplied as extra equipment. Among the



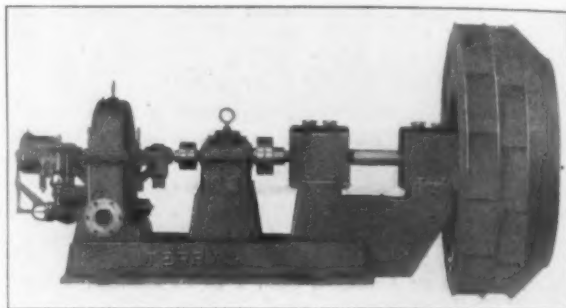
The Extension Arm at the Left Is Intended for Use with a Portable Tool Post Grinding Machine, as Shown, to Enable Deep Internal Work to Be Handled

work which the arm is designed to handle are the grinding of valves and cylinders, the lapping out of deep drawing dies and the grinding of large gages.

The extension arm is a separate unit mounted on ball bearings and receiving power from the motor of the machine through a specially designed leather coupling. This arrangement is relied upon to give an accurate alignment and eliminate vibration. The arm has a reach of 10 in. and is thus designed to increase the range of the smaller high-speed attachment regularly furnished. It can be quickly attached or detached when it is desired to change from one class of work to the other. The arm operates at a speed of 10,000 r.p.m.

### Induced Draft Fan with Turbine Drive

An induced draft fan with turbine drive for use in connection with waste-heat boilers, such as those utilizing the heat in the gases from furnaces and cupolas, has been developed by the Terry Steam Turbine Company, Hartford, Conn. This unit consists of one of the builder's high-speed turbines driving a Green Fuel Economizer Company's fan through a reduction gear. In this way it is possible to utilize the relatively



This Induced Draft Fan for Waste-Heat Boilers Is Driven by a Direct Connected Steam Turbine Through High-Speed Reduction Gears

high speed of the turbine for driving the fan, which, on account of the large volume of air handled, is usually of relatively slow speed.

### Barb-Wire Exports Steadily Growing

Barb-wire exports from the United States are now at the rate of 449,268 gross tons per year, based on the monthly average to Sept. 1, which was 37,439 tons. The exports for recent periods are given in the following table compiled from Government data:

Period	Total, Gross Tons	Per Month, Gross Tons
To Sept. 1, 1916 (eight months)...	299,480	37,439
Fiscal year ended June 30, 1916...	364,283	30,357
Fiscal year ended June 30, 1915...	147,591	12,299
Fiscal year ended June 30, 1914...	79,775	6,648
Calendar year, 1915.....	253,084	21,090
Calendar year, 1914.....	93,400	7,783
Calendar year, 1913.....	82,050	6,837

The exports this year have been constantly on the increase, ranging from 33,962 tons in January to 47,474 tons in July and 46,843 tons in August. Taking the average of the exports for July and August, the output is at the rate of 565,896 tons per year.

Of the total wire exports for the seven months ended July 31, 1916, France had taken 101,790 gross tons; Russia in Europe, 69,086 tons; Canada, 40,989 tons; United Kingdom, 23,671 tons and other countries, 111,527 tons.

Spain is seriously short of coal. Reports state that some qualities cost about \$26 per ton at Madrid and \$19 at Barcelona. Madrid has reduced the consumption of gas and Barcelona has raised the price from \$1.35 to \$1.89 per 1000 cu. ft. Purchase of American coal is seriously planned.

The Biggs-Watterson Company, Cleveland, has opened an office in the Traction Building, Cincinnati, with W. P. Dolle as sales engineer.

## "EXHIBIT OF ENEMY SAMPLES"

### Toronto Shows Low-Priced Manufactures of German Competitors

TORONTO, CANADA, Nov. 4, 1916.—Within one month after the outbreak of the present European war, British consular agents throughout the world began the collection of samples of all kinds of goods manufactured in Germany or Austria and found in the markets throughout the world. Thousands of samples of textiles, clothing, hardware, tools and machinery were collected, and the wholesale and retail prices of each were obtained and affixed to the goods. The articles were brought together in England, exhibited in important cities, and finally sent to Canada for the information of that country in turn. They have just been on exhibition in this city, where hundreds of manufacturers' representatives visited the display with great interest.

The articles were obtained from over 60 different countries of the globe. The characteristic German commercial thoroughness of method is evident everywhere. None of the goods suggests German taste or art, as observed in the various displays made by Germany and Austria in past international expositions. Instead, almost every article looks as if it were made in the country from which the British collector obtained it. Turkish fezzes, Russian countrymen's heavy watch-chains, African machetes and Oriental silks (imitation) do not look at all German. Everything is patterned in the exact style to which the prospective buyer is accustomed. Swatches of textiles are there, which show only patterns of interest to the Asian or African country for which they were destined. Clothing for men, women and children is cut and finished in the peculiar styles in fashion in the places where it was to be worn.

#### CHEAP GERMAN HARDWARE

The metal manufacturer will be interested particularly in the samples of hardware. Most of the German-made pliers and nippers were bought right in Canada. They are a little rougher in finish than those made in Connecticut, for instance, and some show traces of hand work. All of them were put down in Canada at a discount of 60 per cent from the retail selling prices—a margin liberal enough to overcome a good deal of sentiment. Locks (mostly sheet metal kinds for drawers and cupboard doors), bits, gimlets, etc., show the same ratio of retail to wholesale prices.

Some surprising comparisons of price between American and German goods are possible. Barn lanterns for 30c., alarm clocks for 28c., sewing machines for \$8, \$9 and \$10, assorted two-blade pocket-knives for 90c. per card of 12, and one-bladed pocket-knives with cast-iron handles for 4c. each, show the possibilities of cheap manufacture. Almost all the prices quoted for articles exhibited were c.i.f. port of destination. The German manufacturer put his offers in the form most convenient to the buyer in every case. Terms on many of the articles were six months, with 5 per cent discount for cash.

Among oddities of hardware are hand-forged spade and hoe heads, sold in South and East Africa for the native to fit with a rough handle cut in the woods. These were made for 5c. each. Machetes or cane-cutting knives with wooden handles cost \$1 each, up to \$1.50 for the longest. A small screw plate with four dies and four taps was sold for 75c. Razors for use in northern Africa, a flat blade in the roughest sort of wood handle, were sold for 3c. each. Besides these were razors of familiar type and finish, priced wholesale at \$11.70 per dozen, retailing at \$2.50 each—a liberal margin of profit. Nails mounted on cards

were sold for 1½c. per pound for base sizes c.i.f. Nigeria and at 3c. per pound in Manchuria and Morocco; but always dimensioned, packed and listed in the prevailing units of size, weight and quantity as well as currency.

There are many samples of coarse and fine cloths on which the description is embroidered in chainstitch (by machine) in Arabic, Turkish or Chinese. There are blankets from a 4-lb. 60 x 90 in. army for 43c. retail, to soft-finished camel's-hair at \$2 and \$4 each. Clockwork toy locomotives for 87c. and \$1.75 per dozen, and toy steam engines with alcohol lamps for \$1.90 per dozen, give an idea of the manufacturing possibilities of German toymakers. A 3-burner oil stove for cooking was sold for 87c., and a glass hand-lamp with reflector for 6c.

#### HAND LABOR USED LARGELY

No manufacturer can look over this remarkable collection of goods without being impressed with the care that must have been given to the design of each article. The patterns must have been obtained by agents who went to the foreign countries and learned the desires of the inhabitants. Infinite detail was worked out in arranging dimensions, packing, price-lists and terms of sale, so that the transactions could be carried out easily. As a result, the goods became staples in the markets of each country.

It is also evident that the increase of wages which proceeded in Germany and Austria before the war had not reached the point where hand labor became more expensive than machine work. Many of the articles exhibited are obviously hand-made, particularly hand-forged. All of these could be made more cheaply by machine methods. Wooden handles, plane blocks and other wooden parts frequently bear marks of hand fashioning or trimming, and are not as well finished as American-made goods of the same kind. Much of the exhibit is of a quality which would not be a source of pride to an American manufacturer. In this respect, however, there is always a difference of opinion between the manufacturer who wants to do his best and the one who desires to meet the wants of the buyer. Whoever can do both at once is extremely fortunate.

The difference between doing a large export business and doing little or none is merely a difference in thoroughness. United States manufacturers may well learn, with British and Canadians, that the way to a large foreign trade is in the direction of finding out what the buyer wants and giving him that thing, in the way he wants it.

#### Germany's August Steel Output

Germany's steel output for August was 1,412,326 metric tons, or 52,308 tons per day, against 1,385,641 tons in July, or 52,524 tons per day. While this is the largest month's output for the war, the daily rate ranks third, the highest having been 54,990 tons per day in June. The August total was made up of 670,613 tons of Bessemer ingots, 601,273 tons of open-hearth, 113,275 tons of steel castings, 10,072 tons of crucible steel and 17,093 tons of electric steel. The steel casting and crucible steel outputs are the highest for the war. At no time in Germany's history has the electric steel output reached 17,000 tons in one month.

Holland is credited with having imported 36,233 tons of pig iron in the first six months of 1916 against 22,782 tons in the same period of 1915, and 157,332 tons in the like months of 1914. Her pig-iron exports this year were only 36 tons to July 1, 1916, but 3580 tons and 96,603 tons in the same period of 1915 and 1914 respectively. Rail imports for the same period were this year 12,057 tons against 30,611 tons in 1914, while rail exports this year were 1758 tons against 20,294 tons in 1914.

ESTABLISHED 1855

# THE IRON AGE

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## Distortion of World's Trade

Among the most interesting developments of the European war is the diversion of the world's trade into unusual channels. It was observed very early after the outbreak of the war that the regular sources of supply for South American trade would be largely cut off, but it was by no means foreseen that the steel trade of the globe would almost wholly be deprived of the usual contributions from Great Britain, Germany, France and Belgium. Our manufacturers and merchants expected that America would be the beneficiary of Europe's misfortunes to a considerable extent, but the most experienced did not dream that so large a part of the steel requirements of other countries would have to be supplied and could really be furnished by the United States.

This country is now placed in the position of supplying important former customers of Great Britain and Germany with their iron and steel requirements. Markets have been opened to us which had either always been closed for us or had only received American iron and steel products to a limited extent. Even Great Britain has been obliged to take considerable shipments from this country to meet the heavy demand on her own productive resources as the result of the tremendous draft for war purposes. In addition to the restrictions on export trade brought about by home necessities, some of that trade has been cut off by the action of the belligerents themselves. Germany, for instance, is limiting its iron and steel exports to Holland for the purpose of hampering the shipbuilding interests of that country, which the Germans are inclined to believe are operating to the benefit of the Allies. All these influences are tending to increase the enormous movement of iron and steel from this country to the general markets of the world.

The statistics of our exports for September show to what extraordinary figures the movement has grown. Whereas only a few years ago, exports of 200,000 tons per month of the so-called tonnage products would have been deemed large, the figures as published in our issue last week show that September attained the phenomenal aggregate of 643,763 gross tons. In the nine months ended with September our exports of such products were 4,358,189 tons, which is as much as any other country ever exported of similar products in a whole cal-

endar year. We may well take pride in these figures, as they show to what extent this country is equipped to meet the world's requirements in a time of such a violent distortion of ordinary trade movements.

## Steel for Shipbuilding

There has been no diminution in the buying of ships. The early buying could be attributed to an expectation that the yards would be able to deliver the ships in time to participate in the remarkable freight movement, at extremely high prices, that the urgency of war brought about. The latest orders placed, involving delivery after the close of next year, are not based upon participation in war freight rates except as a possibility. There is good opinion that the war will be over by Jan. 1, 1918; but even were there assurance of its being prolonged for another twelvemonth the dangers of loss, possibly greater if the war were thus prolonged, would require a large allowance to be made from the prospective profits.

It is evidently the view of those concerned that the end of the war will find a shortage in merchant-vessel capacity. While there has been feverish activity at all the world's shipyards, an unusual proportion of the capacity has been diverted to the building of war vessels. Before the war the output of merchant vessels had reached a rate of about 3,000,000 tons annually, representing partly replacement and partly an expansion in the world's needs. The amount destroyed in the war to date amounts to more than 3,000,000 tons, while there has been extraordinary depreciation on account of hard driving. The question is whether the war will be found to have set commerce back or forward. The growth in requirements may not be equal to three years of development in peace times, but it certainly must amount to something, and it may possibly amount to more than would have been the case had peace continued. One should not be misled by the statistics of the great amount of ocean commerce now being conducted. The statistics refer to values, not quantities. It is the opinion of some observers that 10,000,000 of vessel tonnage will be needed after the war, representing something like 5,000,000 tons of steel required for the construction, apart from machinery.



## The Flight of Pig Iron

The sensational rise in pig iron that has been in progress in the past few weeks, advances being in dollars per ton when in the past advances of quarters per ton would have been considered remarkable, cannot be analyzed with confidence at this time. It cannot be asserted positively that the rise is due to a shortage already developed. In some of the markets prompt iron has commanded higher prices than iron for forward delivery in occasional instances, but there is no generally established premium market, and some of the cases are attributable to local car shortages.

One thing is obvious, that the settings have all been favorable for the adoption, in sellers' minds, of higher quotations, and the acceptance of them by buyers, whose minds are prepared by the spectacular performances in the steel, coke and coal markets for almost anything. It has not been necessary for the actual physical conditions to exert as much pressure as is ordinarily the case, to move the market.

It may be urged that there are some buyers who cannot afford to pay very high prices for pig iron, but the history of the steel market to date is strongly suggestive that not much reliance should be placed upon such conditions, to apply the brakes to an advancing market. It was being urged a year ago that many consumers of steel could not afford to pay the high prices to which the steel market was then making so rapidly; but events have shown that if some buyers were unable, others, and a great many others, were not only able but anxious. The ability to pay cannot be measured by former standards. As for pig iron itself, there is scarcely any price limit with respect to those who need pig iron for the production of steel. There is no price limit, apparently, in the steel market. If there is any limit it is a time limit, more likely than not the end of the war, and that creates the incentive to produce every ton of steel possible before the end of the war. In past periods of activity in steel the common analysis has been that there are a price limit and a tonnage limit, that the activity would last until a given tonnage had been furnished to consumers, provided the buyers were not discouraged from taking the entire tonnage by prices being permitted to rise to too high a level.

Another precedent that it will be well not to rely upon is that of the pig-iron productive capacity of the country being flexible, the price offered in the market being a factor. There have been fit furnaces, less fit furnaces and still less fit furnaces, down a long line, so that the commercially available pig-iron capacity was so many million tons if \$15 could be secured for the iron, a larger number of tons if \$20 could be secured and a still larger quantity if \$25 could be secured. The view is correct only if raw materials are available. With substantially the same amount of blast-furnace capacity in operation, spot Connellsville furnace coke in the past few weeks has commanded two and one-half times the average price during the first half of the year. Where is coke to be found for the blowing in of the less fit furnaces, when some of the furnaces already in operation, and provided in most cases with

contracts, have been forced to bid such prices? Evidently there is a fear that the production of pig iron will decrease in the next few months, instead of increasing.

## Europe's Growing Steel Output

The idea that has found some currency that the steel industries of Germany and Great Britain have been weakened by the strain of war and will be in that condition when the war ends is completely refuted by the statistical statement on another page. Germany's steel output is now over 82 per cent and her pig-iron production 70 per cent of that of 1913, the record year. Great Britain produced more steel in 1915 than in any previous year and the pig-iron production was nearly 84 per cent of the record total of 1913. Under present high pressure operations it is entirely likely that the British steel output will make a new record this year and that in spite of labor and raw material difficulties nearly as much pig iron will be made as in 1913. Both countries will be able to produce steel and iron in larger quantities when peace comes, and both will be on a new plane of efficiency. With labor more plentiful and raw materials restored to normal channels, with the experience gained in the application of new economies and in the use of metallurgical substitutes, competition from Germany in the world's markets as well as in our own will be sharper than ever. No account is taken in the statistics given elsewhere of the production of steel in the Belgian and French territory which Germany now holds. It can readily be appreciated, however, that with normal exports of 5,000,000 to 6,000,000 tons of iron and steel products cut off, Germany has an output of steel entirely adequate to meet the demands of her unparalleled consumption for ordnance, munitions, shipyards and railroads, and that when the strain is off there will be millions of tons a year for which a place must be found in the world's markets. It is significant in this connection that France, in the portions of her territory free from German control, and with so much of her iron-ore resources now in German hands, has been able to double the 1915 rate of production at the iron and steel plants still operated by their French owners. At the Creusot works, for example, large additional capacity has been built, both in pig iron and steel. Thus there bids fair to be a greater French steel output after the war, to be added to the increases in Germany and Great Britain.

## Noteworthy Freight Car Buying

The rate at which the railroads have been buying freight cars in the past two months and still are so doing is an astonishing one in view of the prices that must be paid, but the buying is perfectly natural in the light of the present car shortage and the prospects of continued heavy freight movement. After the sharp advances that occurred in mill prices of plates, shapes and other descriptions of steel entering into the manufacture of freight cars, the railroads practically withdrew from the market and it was, perhaps, the common view that they would not enter the market again until prices were lower. The heavy buying of the past

two months has occurred with rolled steel commanding higher prices than obtained last spring and with the mills disposed to give the car builders smaller concessions than they were then ready to offer for the purpose of keeping the railroads in the market. A compilation of freight cars ordered each month shows how complete was the withdrawal of the railroads from the market and how clear has been their re-entrance in the past two months. In such a compilation it is impossible to allot every order to the precise month in which it belongs, but the compilation is believed to be substantially correct. The figures below refer to orders for freight cars placed with car shops in the United States, both for domestic use and for export, and include orders placed by railroads with their own shops.

	Freight Cars Ordered
January .....	21,000
February .....	13,000
March .....	11,000
April .....	8,000
May .....	7,000
June .....	4,000
Six months .....	64,000
July .....	2,000
August .....	3,000
September .....	20,000
October .....	32,000
Four months .....	57,000

Thus in the past two months cars have been ordered at the rate of 26,000 per month, against an average rate of less than 5000 per month in the preceding five months, so that the rate of buying has been more than quintupled. A similar record of cars ordered since the beginning of 1913 is as follows:

1913, first half .....	114,000	
second half .....	33,000	
Year 1913 .....		147,000
1914, first half .....	66,000	
second half .....	14,000	
Year 1914 .....		80,000
1915, first half .....	62,000	
second half .....	69,000	
Year 1915 .....		131,000
1916, first half .....	64,000	
four months .....	57,000	
Ten months 1916 .....		121,000

Thus it would require the placing of orders for only 10,000 cars this month and next to make this year's buying as heavy as that of last year, and to exceed the average of 1913-14.

Included in this year's car orders are orders for about 16,000 cars for export, placed chiefly in the first half of the year. Last year's export orders totaled about 23,000 cars. Statistics of the *Railway Age Gazette*, covering freight cars ordered by railroads of the United States and Canada, excluding export orders, and freight cars built in the United States and Canada, whether for export or not, are as follows:

		Freight Cars			
Ordered		Built		Ordered	
1901 .....	193,439	136,950	1909 .....	189,360	93,570
1902 .....	195,248	162,599	1910 .....	141,204	180,945
1903 .....	108,936	153,195	1911 .....	133,117	72,161
1904 .....	136,561	60,806	1912 .....	324,758	152,429
1905 .....	341,315	165,155	1913 .....	146,732	207,684
1906 .....	310,315	240,503	1914 .....	80,264	104,541
1907 .....	151,711	284,188	1915 .....	107,796	74,112
1908 .....	62,669	76,555			

The average indicated by the above figures for the 15 years is 175,000 cars ordered per year and 145,000 cars built. The discrepancy is somewhat large, as the divergence should have been in the opposite direction, because cars built for export are included in the "built" column but not in the "ordered" column. The cars built in Canadian shops are included for 1905 and subsequent years.

The number of cars has been smaller in recent years than formerly, chiefly because there used to be a large business in the replacement of wooden cars by steel cars, a work that is now largely accomplished.

Attention should be called to the small part that export business has played in the car buying of the past two years. The export orders have been large individually, but they have been separated by long intervals, and many of the inquiries have resulted in the business being placed largely in Canada. Of the cars placed with shops in the United States since the beginning of 1915, approximately 252,000, about 39,000, or 15 per cent, have been for export.

Locomotive buying has swung in a different direction from car buying. There were more locomotives bought in the first half of this year than in all of last year. A study of the rate of buying suggests that when freight cars advanced sharply in price the railroads turned their attention to locomotives, as while they also had advanced in price the percentage of advance was not so great. Thus far this year about 3400 locomotives have been ordered from shops in the United States, about one-third the number of locomotives being for export. As many of these were narrow-gage, the value of the export business was less than one-third the total.

Another interesting point is that in the car business history is repeating itself. The buyer is finding the producers' order books so well filled that his inquiries are carefully scrutinized to eliminate the unattractive, while fresh foreign business, not considering the large Russian order about ready for placing, is given scant consideration. Following the heavy preemption of wide plates for shipbuilding, the late buying of steel cars has resulted in good bookings for the narrower plates and the country's capacity for tank cars is pretty well engaged for all of 1917. Thus here is another analogy to the condition of the steel mills, and few cars of any kind ordered now can be delivered before July, 1917.

### The British Ferromanganese Market

The weekly market report of the *London Iron and Coal Trades Review* for Oct. 13, 1916, has the following regarding ferromanganese:

A fair demand continues for ferromanganese, with prices nominally unchanged in this country. There is no relaxation in the official attitude in regard to licenses for foreign shipments. The British makers, however, have made a reduction of £2 per ton in their price for shipment this year or during 1917 to the United States. This brings the English product to a price of approximately £33, seaboard, as against a former level of £35, in effect for several months. English makers have found that the market in America recently has been practically dominated by domestic producers who have been accepting £33, delivered, for the 80 per cent alloy. Considerable tonnage has been booked by the American makers on this basis. The lower English price now offered is made subject to the submission to the makers of each inquiry by the agents in America, and also is contingent upon licenses to ship for the delivery prescribed being granted by the British authorities.

### Large Exports of Railroad Cars

Exports from the United States of cars for steam railroads exceed all records. For the eight months to Sept. 1, 1916, the total value is \$16,678,909, or \$2,084,863 per month. Only \$391,728 represents passenger cars, the rest being classified as "all other," probably freight. In 1915 the total value was \$10,025,305, and in 1913, \$11,985,181, or \$998,765 per month. The present rate is therefore double that for 1913, and if maintained will make the 1916 total exceed \$24,000,000.



## GERMAN AND BRITISH STEEL

## Output in Both Countries Has Grown in the Years of the War

In both Germany and Great Britain the steel industry has made great strides in output and productive capacity as the war has progressed. In Germany the war's outbreak reduced the iron and steel production over 60 per cent, but since then the recovery has been very rapid. In Great Britain the first shock was not so severe, but the expansion has been noteworthy ever since.

## GERMANY'S STEEL AND PIG-IRON OUTPUT

The following table, based on the official data of the Association of German Iron and Steel Manufacturers, gives the comparative pig-iron and steel output for calendar years and for the two war years, August to July, inclusive, in metric tons.

	Steel	Pig Iron
1911	15,019,838	15,280,527
1912	17,301,998	17,868,909
1913	18,958,819	19,309,172
1914	14,973,106	14,389,547
1915	13,237,645	11,790,199
1916*	15,616,296	13,190,172
First year of war	11,355,841	10,135,319
Second year of war	12,025,208	12,840,743

\*Estimated.

The pig-iron output in the second war year has ranged from a minimum of 1,034,124 tons in September, 1915, to 1,134,306 tons in July, 1916, while in the first year of war the range was from a minimum of 580,087 tons in September, 1914, to 1,064,899 tons in July, 1915. In 1916 the range has been from a minimum of 1,036,683 tons in February, to 1,145,292 tons in August. Based on the August rate, Germany's pig-iron production is now at 70 per cent of that in the peak year, 1913.

The above estimate of over 15,500,000 tons for Germany's steel production in 1916 is based on an actual output of 15,025,208 tons in the second war year. The monthly range has been between 1,157,692 tons (minimum) in August, 1915, and 1,366,107 tons in July, 1916. The production in the first war year ranged from a minimum of 566,822 tons in August, 1914, to 1,138,651 tons in July, 1915. The 1916 range has been from 1,212,695 tons in April to 1,366,107 tons in July. In May, June and July, 1916, Germany produced 4,097,562 tons of steel, or at the rate of 16,390,248 tons a year.

These figures show that Germany's present steel output is over 82 per cent of that in 1913, when her unparalleled exports brought her production to the highest point in her history.

## CHARACTER OF THE GERMAN WAR PRODUCTION

The extent to which the war has affected the character of the German steel and pig-iron output is shown by the following tables of percentages:

Steel		First War Year	Second War Year
Bessemer ingots	1912 57.7	50.6	49.3
Open-hearth	38.9	43.6	42.7
Steel castings	1.9	3.66	6.16
Crucible steel	0.46	0.80	0.69
Electric steel	0.44	0.79	1.12
Pig Iron		1913	1914
Foundry	18.94	17.34	15.3
Bessemer	1.91	1.65	1.41
Basic	63.15	64.74	63.1
Steel-making and			
Spiegeleisen	13.46	13.88	17.5
Forge or puddle	2.53	2.58	1.87

The Bessemer ingot output has decreased over 7 per cent during the war, while the open-hearth steel output has increased over 3 per cent. The striking facts, however, are that the steel-casting output has nearly doubled, the crucible steel output has decreased about 12 per cent and the electric steel output has expanded nearly 40 per cent.

In pig iron the changes have been less marked. While the foundry iron output has decreased, basic iron has maintained its own, and the steel-making iron and the spiegeleisen production has increased considerably.

## GREAT BRITAIN'S STEEL AND IRON OUTPUT

Official statistics of Great Britain are available only

up to Jan. 1, 1916. For the past five years they are as follows in gross tons:

	Steel Ingots	Pig Iron
1911	6,461,612	9,718,638
1912	6,795,144	8,889,124
1913	7,663,876	10,481,917
1914	7,835,113	9,005,898
1915	8,350,944	8,793,659

The British pig-iron output in 1915 was 83.75 per cent of normal, using that for 1913 as a basis. The steel output exceeds that for any year previous, the monthly rate having been 695,912 tons against 678,656 tons per month in 1913. Under present high pressure operations, it is to be expected that a new record in steel production will be made in 1916.

## Larger Lake Ore Shipments in October

Iron ore shipments down the Lakes from the Lake Superior region in October were 9,116,196 gross tons, compared with 7,146,873 tons in October, 1915. The October shipments compare with 9,600,786 tons in September, 1916, the largest monthly shipments ever recorded. The increase in October is 27.55 per cent over the total for October, 1915. The following table gives the October and season shipments by ports and the corresponding figures for 1915 in gross tons:

	October, 1916	October, 1915	To Nov. 1, 1916	To Nov. 1, 1915
Escanaba	876,488	928,399	6,507,482	4,940,081
Marquette	519,806	522,671	3,546,651	2,836,203
Ashland	1,218,134	866,170	7,269,846	4,695,752
Superior	1,732,865	1,351,893	11,493,831	7,348,916
Duluth	3,298,314	2,301,352	19,472,473	14,108,571
Two Harbors	1,470,589	1,176,388	9,642,563	7,886,916
Total	9,116,196	7,146,873	57,932,846	41,816,439
1916 increase	1,969,323		16,116,407	

The Duluth percentage to Nov. 1, 1916, was 33.61 against 33.74 last year, while the Great Northern dock at Superior shipped 17.29 per cent of the total this year against 15.14 per cent to Nov. 1, 1915. The increase to Nov. 1, this year, of 16,116,407 tons, or 38.54 per cent, contrasts with an increase of 35.10 per cent to Nov. 1, 1915, and a decrease of 32.42 per cent to Nov. 1, 1914.

## Higher Demurrage Rates Proposed

WASHINGTON, D. C., Nov. 6, 1916.—Carriers have begun to file tariffs with the Interstate Commerce Commission to carry out their threats to advance demurrage rates and change rules relating to the detention of cars, in accordance with the notice they served upon the National Industrial Traffic League in August, after futile conferences had been held. The two interests split, not on rates, but on the rules. The railroads propose to eliminate the regulation which stops the running of free time while weather conditions are such as to prevent unloading of cars. They claim shippers abuse that rule.

A committee from the League on Nov. 4 made a formal protest to commissioners with whom they were able to procure personal interviews, asking the suspension of the new tariffs, in which the basic penalty is raised for detention beyond the period of free time. The League objected to this, but its protest is less emphatic than on the elimination of the weather condition rule. The penalty, if the new tariffs are allowed to become operative, will progress from \$2 for the first day beyond the free time of 48 hours, to \$3 for the second day, \$4 for the third and \$5 for the fourth day.

W. L. C.

Col. Thomas Cantley, president, reported at a board meeting of the Nova Scotia Coal & Steel Company, held at Montreal recently, that the company's output for the first nine months of the year is 40 per cent higher than that of the previous year. It was decided to enlarge the company's shipbuilding activities by building a second ocean-going vessel. In the works of the Eastern Car Company, a subsidiary, a drop forging plant and an electric furnace are being installed. These will make the works self-contained in practically every respect. As regards forward business, he stated that the company was booked practically to capacity to the middle of 1917.



## Sheet and Furnace Interests Merge

A merger of the American Rolling Mill Company, Middletown, Ohio, with the Columbus Iron & Steel Company, Columbus, Ohio, has been effected. It is understood that both companies will continue to operate under their respective names, but a new holding company will be organized under the name of the American Rolling Mill Company, which will be the parent company.

The Columbus Iron & Steel Company operates two blast furnaces and is contemplating further extensions. It is also interested in iron-ore and coke properties in different parts of the country. J. G. Battelle is president of the company; J. H. Franz, vice-president, and J. C. Miller, secretary and treasurer.

The American Rolling Mill Company's officers are George M. Verity, president; R. B. Carnahan, Jr., W. S. Horner and Charles R. Hook, vice-presidents; R. C. Phillips, secretary; N. W. Collord, treasurer, and G. H. Charls, general manager of sales.

## Railroad Car Buying

With car builders' shops well booked for the first half of 1917, and so far as tank cars are concerned for practically all of 1917, and with sales in the past two weeks totaling over 26,000 cars following upward of 10,000 cars closed three weeks ago and with active inquiries at the present time for all of 10,000 cars, the car builders are beginning to choose the business offered, particularly that coming from foreign sources. Incidentally the large Russian car order is expected shortly to materialize and further buying for France is under consideration. Much that is placed for domestic roads is done quietly and at this writing several thousand cars have been put under contract but the details cannot be learned and the totals are not included in the foregoing figures.

The late purchases and inquiries of different roads are as follows: Union Pacific, 1500 box and 1000 automobile cars bought; Illinois Central, 400 ballast cars bought and 600 general service and 2000 gondola cars inquired for; Great Northern, 1000 refrigerator and 1500 box cars, inquired for; Baltimore & Ohio, 980 more freight cars and 100 passenger cars bought; Philadelphia & Reading, 2000 hopper cars bought, half of Cambria Steel Company, and the other half divided between the Pressed Steel and the Standard Steel Car Companies; the Burlington, 1500 cars bought; the New York Central, 1000 cars placed with the Barney & Smith Car Company and passenger cars distributed thus: 125 to American Car & Foundry Company, 60 to the Pressed Steel Car Company, 75 to the Standard Steel Car Company and 25 to Barney & Smith Car Company; Chicago & Northwestern, 200 stock cars bought; Erie, 1000 box cars bought; Atlantic Coast Line, 1700 cars bought; Southern, 2813 placed, 1500 with the Lenoir Car Works and the remainder with the Pressed Steel Car Company; Louisville & Nashville, 2000 additional cars placed and 1500 underframes; Missouri, Kansas & Texas, 1000 cars under revived inquiry; Atchison, 500 tank cars bought; the Soo Line, 1000 cars placed with the Haskell & Barker Car Company; Northern Pacific, 350 ore cars placed; Cambria & Indiana, 1000 cars bought of the Cambria Steel Company, and the Chesapeake & Ohio, 1500 car repairs, contracted for. A number of active inquiries involve 500 tank cars, and the foreign business offered covers 175 passenger cars for Spain and some 75 cars for China.

The United Alloy Steel Corporation, Canton, Ohio, according to an announcement made by the president, Harry R. Jones, contemplates the erection, next year, of a large plant for the manufacture of heavy railroad forgings in alloy steels. Other extensions to be made are additional finishing mills and an enlargement of the electric furnace department. It is stated that the proposed extensions will involve an expenditure of about \$2,000,000.

## Oppose Western Trunk Line Rate Advance

WASHINGTON, D. C., Nov. 6, 1916.—A determined contest has been begun, between the railroads in the section known as Western Trunk Line territory on the one hand and iron and steel manufacturers and consumers on the other, over an advance in rates on iron and steel proposed by the carriers. The iron and steel interests have asked for the suspension of a tariff canceling commodity rates so as to make the fifth-class rates apply throughout that territory. Roughly speaking, the eastern boundary of the affected region is a line drawn from Chicago to St. Louis with the foothills of the Rocky Mountains as the western limit.

The advances, according to declarations made to members of the Suspension Board of the Interstate Commerce Commission, will range from 15 to 40 per cent. They apply on everything in the iron and steel list except pipe. It is the intention of the carriers, however, to file tariffs advancing charges on pipe from a commodity basis of much less than fifth class, in many instances, to as near fifth class as possible. On account of conditions in Oklahoma, fifth class is impracticable on pipe throughout the territory.

Protests, both written and oral, have been made by numerous representatives of manufacturers and consumers. Uniformity is the reason given by the carriers for their proposal. Their defense has been conducted by E. B. Boyd, their agent in the filing of the tariff. No traffic manager has thus far appeared to explain why uniformity should be accomplished at the expense of the consumers of iron and steel. Kansas City interests assert that even if uniformity is brought about the effect will be disastrous to them because their advances will be 6 and 7 cents per 100 lb., while those of Chicago will be only 1 and 2 cents and no change in the raw material rates, which Kansas City declares now heavily favor Chicago. Chicago, Quincy and St. Louis stove and range manufacturers have protested particularly against the advances on their wares to Duluth and the Twin Cities.

WASHINGTON, Nov. 7.—Freight tariffs proposing increased rates ranging from 5c. to 7c. per 100 lbs. in the iron and steel traffic between Chicago, Florida, St. Louis and Kansas City and Des Moines, St. Paul, Duluth and other points in the Western Trunk Line territory were suspended by the Interstate Commerce Commission to-day from Nov. 10 until March 10, pending investigation. The tariffs provided for cancellation of the present commodity rates on iron and steel articles in carloads between these points.

W. L. C.

## Locomotive Orders Increase

The railroads of the country continue to order and inquire for large numbers of locomotives. In the past week they have placed contracts for 84 and issued inquiries for 98. The Southern Railroad contemplates buying 45, the Chicago, Burlington & Quincy 30, the Union Pacific 15 and the Duluth, Mesaba & Northern 6. The American Locomotive Company will build 40 consolidation locomotives for the Italian State Railways, 10 Pacifics for El Paso & Southwestern and 5 locomotives each for the Delaware, Lackawanna & Western, the Central Railroad of New Jersey and the Western Pacific. The Louisville & Nashville is building 8 Mikados in its own shops and will soon start the construction of 8 more. It is stated that the British Government has recently increased to 395 its order for 45 narrow gage tank locomotives given to the Baldwin Locomotive Works late in August. The British War Office is also reported about to increase the order recently given to the American Locomotive Company for 100 18-ton tank locomotives by 100 or 150 engines. Expectations are keen that the Russian Government will very soon close definite contracts for 400 Decapod locomotives. The understanding is that Canadian builders will secure 40 to 60 of these, the remainder to be divided between the American Locomotive Company and the Baldwin Locomotive Works.

Ferrotungsten exports in August were very large—47,966 lb., bringing the total to Sept. 1, 1916, to 56,373 lb.

### The Wharton Steel Company Properties

There has been no further development in the past week concerning the Wharton Steel Company properties which were reported recently to have been acquired by J. Leonard Replogle. Examinations of the blast furnace and iron-ore properties have been made by engineers and their reports will determine the line of future action. It is understood that Mr. Replogle has an option running until January 1 and that decisions as to his acceptance of the property and his plans concerning it have not yet been made.

### United Engineering Buys Tod Company

The United Engineering & Foundry Company, with main offices in the Farmers' Bank Building, Pittsburgh, has taken over the entire holdings of the William Tod Company, Youngstown, Ohio. The property thus acquired consists of about nine acres, lying in the heart of the industrial section of Youngstown, on which are located about 20 buildings of various sizes devoted to the manufacture of engines, hydraulic machinery and iron and steel works equipment of all kinds. The Tod Company has built blooming mills and other machinery for the Youngstown Sheet & Tube Company, Republic Iron & Steel Company, Brier Hill Steel Company and Youngstown Iron & Steel Company. It enjoys a large foreign trade, having under construction in its shops a plate mill for shipment to the Imperial Steel Works at Kobe, Japan, and sheet mills also for Japan. It has been turning out large quantities of shells for the Allies for about two years, starting this work shortly after the war broke out. The official announcement of the completion of the deal is, in part, as follows:

The controlling interests in the William Tod Company exchange their stock for stock of the United Engineering & Foundry Company. The plant of the William Tod Company will for the present at least be operated as a separate unit and with the present operating organization. At a special meeting of the board of directors of the William Tod Company, the following officers were elected: President, John T. Harrington; vice-president, C. H. Booth; secretary and treasurer, H. J. Stambaugh. The following directors were elected: David Tod, John Stambaugh, C. H. Booth, H. M. Kelly and John T. Harrington.

The William Tod Company had an authorized capital of \$1,500,000, of which \$1,000,000 common stock was outstanding. The other \$500,000 was preferred stock and was held in the treasury. The United Engineering & Foundry Company has outstanding \$6,600,000 of stock, of which \$4,600,000 is common. The acquisition of the Tod Company will give the United Engineering Company a line of product in rolling-mill, steel-works and blast-furnace engines which it has not built heretofore. It will now be in position to furnish practically every kind of equipment needed for blast furnaces, rolling mills, steel works and sheet and tin mills. The William Tod Company was established in 1856, therefore being one of the oldest manufacturing concerns in the Youngstown district.

### New Steel Tubing Factory at Detroit

A new plant for the manufacture of steel tubing and tubular products will be established in Detroit by the Michigan Steel Tube Products Company, incorporated with a capital stock of \$300,000. W. O. Briggs is president; Frank Navin, vice-president; H. A. Flagg, secretary, and C. E. Miller, treasurer. The officers and L. A. Young and Frank Kritz comprise the board of directors. Messrs. Kritz, Miller and Flagg have long been identified with the steel tubing business, Mr. Kritz in manufacturing and Messrs. Flagg and Miller in the selling end. Mr. Flagg was formerly sales manager of the Standard Welding Company, Cleveland, and Mr. Miller was manager of its Detroit office. The new company has opened a temporary office at 75 Baltimore Avenue, West. Ground is now being broken for building construction.

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### Iron-Ore Exports Increasing

Iron-ore exports from the United States are now at a greater rate than in 1915 or in 1913, while present imports are only 50 per cent of what they were in 1913, but a little in excess of those for 1915. The following table compiled from Government data shows this in gross tons:

	Average Imports Per Month	Average Exports Per Month
To Sept. 1, 1916.....	114,982	91,809
Calendar year, 1915.....	111,773	59,053
Calendar year, 1913.....	216,230	86,846

These show the exports 500 tons per month greater than in 1913 and much larger than in 1915, despite the threatened scarcity at home.



## HIGHEST PIG-IRON OUTPUT

## Remarkable Performance in October

Steel Company Output Exceeds All Records—  
Merchant Furnace Gain

Following the October tradition, many pig-iron producers pushed their furnaces to the utmost last month. Considering the handicap some of the merchant furnaces had in shortened coke supply, the output of the month was a marvel, the large steel companies in the Pittsburgh and Chicago districts in particular making surprising records. The total for the month was 3,508,849 tons, or 113,189 tons a day, against 3,202,366 tons in September, or 106,745 tons a day. The estimate of capacity active Nov. 1, based on average output of the furnaces then in blast, rather than the spectacular performances of October, was 108,622 tons a day for 326 furnaces against 106,578 tons a day for 328 furnaces on Oct. 1.

## DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from October, 1915, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons			
	Steel Works	Merchant	Total
October, 1915	73,595	27,227	100,822
November	73,282	27,962	101,244
December	73,647	29,686	103,333
January, 1916	72,614	30,132	102,746
February	75,305	31,151	106,456
March	76,274	31,393	107,667
April	77,226	30,366	107,592
May	77,706	30,716	108,422
June	76,526	30,527	107,053
July	74,397	29,620	104,017
August	74,617	28,729	103,346
September	76,990	29,755	106,745
October	81,639	31,550	113,189

## CAPACITY IN BLAST NOVEMBER 1 AND OCTOBER 1

The following table shows the daily capacity in gross tons of furnaces in blast Nov. 1 and Oct. 1 by districts:

Coke and Anthracite Furnaces in Blast					
Location of furnaces	Total		Nov. 1		Oct. 1
	Number of stacks	Capacity per day	Number in blast	Capacity per day	Number in blast
<b>New York:</b>					
Buffalo	19	5,843	17	5,747	
Other New York	5	562	3	583	
New Jersey	6	240	1	230	
<b>Pennsylvania:</b>					
Lehigh Valley	20	3,650	13	3,378	
Spiegel	2	192	1	109	
Schuylkill Val.	12	3,212	11	3,049	
Lower Susquehanna	6	1,427	5	1,322	
Lebanon Val.	8	923	6	742	
Ferro and Spiegel	2	141	1	86	
Pitts. District	53	24,515	52	23,839	
Ferro	3	424	3	408	
Shenango Val.	19	5,799	19	6,176	
Western Pa.	24	5,826	20	6,014	
Ferro and Spiegel	3	127	2	201	
Maryland	4	1,553	4	1,600	
Wheeling Dist.	14	4,491	14	4,499	
<b>Ohio:</b>					
Mahoning Val.	25	10,504	25	11,031	
Central and Northern	24	8,144	22	8,232	
Hock. Val. and Hang'g Rock	15	1,639	11	1,608	
Illinois and Ind.	35	15,191	32	13,563	
Ferro	2	0	1	84	
Michigan, Wis. & Minn.	12	2,849	10	2,834	
Colo. and Mo.	6	1,094	4	1,325	
Ferro	1	105	1	55	
<b>The South:</b>					
Virginia	18	956	9	1,131	
Kentucky	5	623	3	458	
Alabama	37	7,457	27	7,258	
Ferro	1	70	1	59	
Tennessee	15	1,065	10	957	
<b>Total</b>	<b>394</b>		<b>326</b>		<b>328</b>
					<b>106,578</b>

Among the furnaces blown in between Oct. 1 and Nov. 1 were one Palmerton in the Lehigh Valley, one Lebanon stack of the Bethlehem Steel Company in the Lebanon Valley, one Ashland in Kentucky, Newburgh in Ohio, one South Chicago in the Chicago district, one Sloss in Alabama and Napier in Tennessee.

The furnaces blown out last month include one Edgar Thomson in the Pittsburgh district, one Shenango in the Shenango Valley, one Cambria in western Penn-

sylvania, Max Meadows in Virginia, one Haselton in the Mahoning Valley, Dover in Ohio, Bessemer in the Hanging Rock district, Miami in the Chicago district and one Bessemer in Alabama.

## OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in October and the three months preceding:

Monthly Pig-Iron Production—Gross Tons				
	July (31 days)	Aug. (31 days)	Sept. (30 days)	Oct. (31 days)
New York	190,319	182,812	185,483	194,657
New Jersey	6,621	7,020	6,907	7,431
Lehigh Valley	104,835	99,650	104,989	122,025
Schuylkill Valley	89,811	88,373	91,453	99,587
Lower Susquehanna and Lebanon Valley	73,440	69,558	64,514	72,574
Pittsburgh district	736,477	721,917	724,183	812,572
Shenango Valley	178,903	179,970	185,276	194,534
Western Pennsylvania	169,979	172,970	183,647	187,764
Maryland, Virginia and Kentucky	87,294	92,540	94,382	97,612
Wheeling district	128,135	123,426	124,034	139,225
Mahoning Valley	314,461	326,413	316,907	339,592
Central and Northern Ohio	261,162	263,587	248,434	273,485
Hocking Valley and Hanging Rock	48,624	50,168	43,948	50,797
Chicago district	465,895	460,836	457,637	504,368
Mich., Minn., Mo., Wis. and Col.	121,285	115,341	121,877	131,389
Alabama	213,973	219,076	219,508	248,863
Tennessee	33,299	30,056	29,157	32,374
<b>Total</b>	<b>3,224,513</b>	<b>3,203,713</b>	<b>3,202,366</b>	<b>3,508,849</b>

## PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of steel-making iron month by month, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons					
	Fig. total production			Spiegeleisen and ferromanganese	
	1914	1915	1916	1914	1915
Jan.	1,261,430	1,115,944	2,251,035	17,325	18,041
Feb.	1,329,414	1,237,380	2,183,845	10,524	13,319
Mar.	1,704,688	1,551,082	2,365,116	20,133	12,274
Apr.	1,635,226	1,584,111	2,316,768	18,676	12,337
May	1,457,847	1,694,290	2,408,890	21,504	13,440
June	1,329,623	1,770,657	2,295,784	16,254	19,200
July	1,395,851	1,949,750	2,306,803	16,524	17,854
Aug.	1,455,054	2,101,818	2,313,122	11,577	27,463
Sept.	1,390,322	2,129,322	2,309,710	13,786	23,159
Oct.	1,271,820	2,281,456	3,530,806	17,435	23,992
Nov.	1,059,159	2,198,459		21,977	28,741
Dec.	1,034,802	2,283,047		20,733	25,004

## THE RECORD OF PRODUCTION

## Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1912—Gross Tons

	1912				
	1912	1913	1914	1915	1916
Jan.	2,057,911	2,795,331	1,885,054	1,601,421	3,185,121
Feb.	2,100,815	2,586,337	1,888,670	1,674,771	3,087,212
Mar.	2,405,318	2,763,563	2,347,867	2,063,834	3,337,691
Apr.	2,375,436	2,752,761	2,269,655	2,116,494	3,227,768
May	2,512,582	2,822,217	2,092,686	2,263,470	3,361,073
June	2,440,745	2,628,565	1,917,783	2,380,827	3,211,588
July	2,410,889	2,560,646	1,957,645	2,563,420	3,224,512
Aug.	2,512,431	2,545,763	1,995,261	2,779,647	3,203,713
Sept.	2,463,839	2,505,927	1,882,577	2,852,561	3,202,366
Oct.	2,689,933	2,546,261	1,778,186	3,125,491	3,508,849
10 mo.	23,969,899	26,507,371	20,015,384	23,421,936	32,549,894
Nov.	2,630,854	2,233,123	1,518,316	3,037,308	
Dec.	2,782,737	1,983,607	1,515,752	3,203,322	
<b>Total</b>	<b>29,383,490</b>	<b>30,724,101</b>	<b>23,049,752</b>	<b>29,662,566</b>	

## DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The figures for daily average production, beginning January, 1909, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1909, Gross Tons										
	1909	1910	1911	1912	1913	1914	1915	1916		
Jan.	57,975	84,148	56,752	66,384	90,172	60,808	51,659	102,746		
Feb.	60,976	85,616	64,090	72,442	92,369	67,453	59,813	106,456		
Mar.	59,232	84,459	70,036	77,591	89,147	75,738	66,575	107,667		
Apr.	57,962	82,792	68,836	79,181	91,759	75,665	70,550	107,592		
May	60,753	77,102	61,079	81,051	91,039	67,506	73,015	108,422		
June	64,656	75,516	59,585	81,358	87,619	63,916	79,361	107,053		
July	67,793	69,305	57,841	77,738	82,601	63,150	82,691	104,017		
Aug.	72,546	67,963	62,150	81,046	82,057	64,363	89,666	103,346		
Sept.	79,507	68,476	65,903	82,128	83,531	62,753	95,085	106,745		
Oct.	83,856	67,520	67,811	86,722	82,133	57,361	100,822	113,189		
Nov.	84,917	63,659	66,648	87,697	74,453	50,611	101,244			
Dec.	85,022	57,349	65,912	89,766	63,987	48,896	103,333			

The fluctuations in pig-iron production from January, 1908, to the present time are shown in the accompanying chart. The figures represented by the heavy



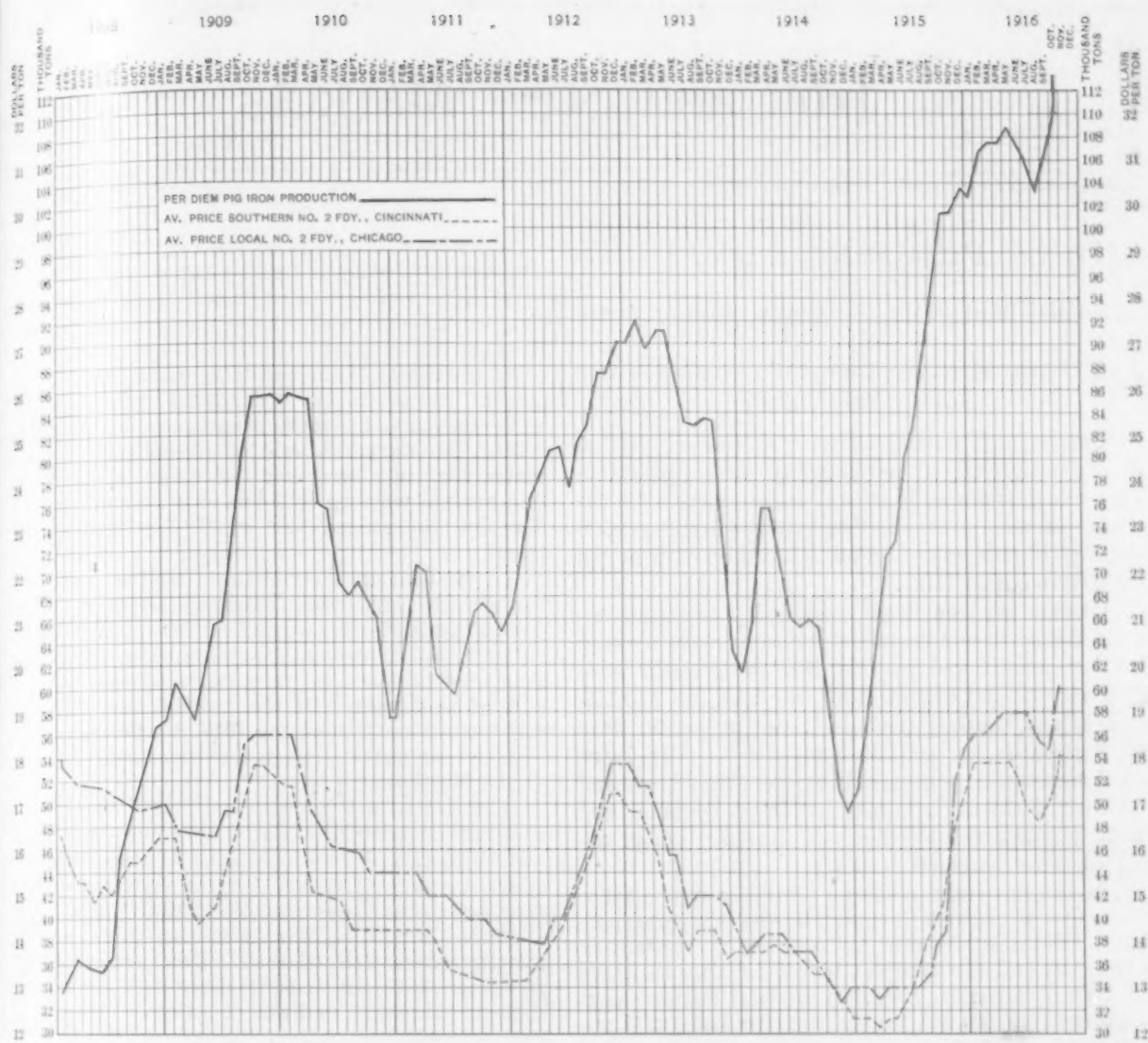


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from Jan. 1, 1908, to Nov. 1, 1916; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE.

### Iroquois Iron Will Build New Stack

The Iroquois Iron Company, Chicago, which some time ago announced its intention to build a fifth furnace, has decided to proceed with that plan. It is also planned to remodel its A furnace, now under lease to the Miami Products Company for the manufacture of ferromanganese and spiegeleisen, increasing its capacity to 300 tons daily. This work will probably not be undertaken until next March, as it will, of course, involve the termination of the Miami operation.

The blast furnace operated by the Miami Products Company at Chicago in the manufacture of ferromanganese is out for relining. As only the jacket lining was lost, the delay in operations is not expected to exceed two weeks. The company has good orders on its books and has been making sales at prices ranging upward from \$166.

The blast furnace at Rome, Ga., which has been idle for several years, is reported to have been leased by Chattanooga capitalists and will be blown in as soon as it is put in condition. It is the only furnace in that section now idle.

### Youngstown Sheet & Tube Company to Add to Steel Capacity

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has completed the program for large additions to its plants at East Youngstown, including three more 100-ton open-hearth furnaces, four additional pit heating furnaces, a new ingot stripping department, a new cinder yard, with the necessary breaking and handling machinery, a roll shop and a locomotive repair shop. To cover the necessary structural work in connection with these extensions, the company has contracted with the McClintic-Marshall Company of Pittsburgh for approximately 4000 tons of structural steel erection. After these additions have all been completed the ingot capacity in Bessemer and open-hearth steel of the Youngstown Sheet & Tube Company will be 135,000 gross tons per month. Several months ago the Youngstown Sheet & Tube Company completed the building of three 100-ton open-hearth furnaces, having previously had six, so that with the three more just authorized the company will have a total of 12 100-ton open-hearth furnaces. It also operates a Bessemer department, containing two 12-ton converters. Contracts for this additional equipment will soon be placed.

### Two More Open-Hearths for Inland

The Inland Steel Company, Chicago, which has just completed a battery of eight 80-ton open-hearth furnaces as a part of its large plant extensions, announces that it will build two additional furnaces of like capacity, extending the new open-hearth building for the purpose. It is expected that the additional furnaces will be completed in six months.

# Iron and Steel Markets

## SHARP PIG-IRON ADVANCES

### Finished Materials Moving to New Levels

#### New Blast Furnace Record in October—Car Buying Very Active

The pig-iron market shows a continuance of the excited conditions of the past two weeks, with further sharp advances in price. At the same time the action of steel products has confirmed the predictions of higher prices and of full occupation of the mills throughout 1917.

October pig iron output exceeded all expectations. It is the furnace companies' habit to make a spurt in that month and in this case all records were broken with a total of 3,508,849 tons, or 113,189 tons a day, against 3,202,366 tons in the 30 days of September, or 106,745 tons a day. The large steel companies, particularly in the Pittsburgh and Chicago districts, strained for great outputs, and were unhampered by the coke shortage which affected some merchant stacks.

In the present condition of the pig iron market the great production last month was highly opportune. Nothing like it is to be looked for as winter comes on and car troubles increase. Our estimate of Nov. 1 capacity, based on average furnace performance, is 108,622 tons a day for 326 furnaces, against 106,578 tons a day for 328 furnaces on Oct. 1. Allowing 400,000 tons a year for charcoal iron, the October output represents a yearly rate of no less than 41,700,000 tons.

The political tension of the week and the closeness of the election have apparently had no effect on the buying of iron and steel. Probably no week before a national election has shown more activity in those markets.

Last week's sensational advances in pig iron did not check but rather stimulated buying, but the market is in confusion over wide variations in prices and the withdrawal of a good many sellers, particularly on business for the second half of 1917. Some of the new advances are without a parallel for a single week. Virginia iron, which last week sold at \$19.50, is now \$24. Eastern Pennsylvania basic, quoted last week at \$21.50, is now \$25. Lake Superior charcoal iron, Chicago, has gone from \$20.25 to \$25. Southern No. 2 iron has sold at \$18, Birmingham, in the past two days, and some sellers got \$20, while two important producers are out of the market.

In the Central West Bessemer iron has sold at \$27, Valley furnace, and basic at \$23, an advance of \$1 for both. The buying of steel-making iron for export promises to keep up, and a rising market is indicated.

The rise in finished steel products goes on. On black sheets the leading interest, which is now practically sold up for the first half, has made advances of \$2 to \$3 a ton. It has followed independent tin plate makers in putting its price at \$6 per base box, or 25c. above its first sales for the first half. Wire nails were advanced \$3 on Nov. 6, or to \$2.85,

while fence wire has gone from \$2.65 to \$2.80, and woven wire fencing is up \$6 a ton.

On the leading finished steel products—plates, structural shapes and bars—some mills are refusing to quote for next year except on specific amounts to cover contracts in the hands of manufacturing consumers. In plates the inability of the mills to cope with the demand is more pronounced and prices are telling the story. A sale of 12,000 tons of export plates for Italy was made at 4.48c., Eastern mill. One central western mill has entered ship plate orders for the second half of 1917 at 4.50c., Pittsburgh.

In the Chicago district there has been good buying of cars, rails, track fastenings and bars. About 100,000 tons of steel was taken for the Western car lettings, and implement manufacturers added 40,000 tons of steel bars to their purchases for the first half of next year. Of the 100,000 tons additional rails placed at Chicago for 1917, 50,000 tons are for France and 30,000 tons for a transcontinental line of the Northwest.

Car orders are growing as prices rise. In the past three weeks fully 36,000 cars have been placed and builders are now beginning to choose between offers, being well booked for the first half of next year and on tank cars for all of 1917.

There is nothing new as to shell steel contracts for the second half of 1917. Two large steel companies are believed to have closed recently for considerable amounts, and the situation is that on some hundreds of thousands of tons of rounds and forging billets that must be bought there will be no particular haggling over the price.

In cast-iron pipe an advance of \$3 to \$4 a ton is imminent, following the upward movement in pig iron. Chicago is about to contract for 18,000 tons.

## Pittsburgh

PITTSBURGH, PA., Nov. 7, 1916.

An advance of at least \$1 per ton on Bessemer pig iron, \$1 on basic and foundry iron, \$2 to \$3 on sheets, 25c. per box on tin plate, from the lowest price heretofore quoted, \$3 per ton on wire products, \$6 on woven wire fencing, probably \$5 on wire rods, and \$1 to \$2 per ton on nearly all grades of scrap are some of the developments of the past week. It is almost impossible to keep up with the advances in prices, a quotation sent out at the full market price often being \$1 to \$2 per ton below the market a day or two after. On some lines of finished steel, notably plates, sheets and tin plate, consumers are sending in orders asking that they be entered for delivery in the second half of 1917, the price to be fixed by the mill when the proper time comes to do so. The strength of the market is shown in the fact that some of the larger steel mills are refusing to quote prices on some lines of finished steel except for specific work, and will only protect the customer on the actual amount involved in his contract. The shortage in cars is getting worse. Not much relief can be expected in this direction before next spring, but the situation is liable to get much worse. There is also a great scarcity of labor, and it is no uncommon thing for superintendents of mills to offer \$3 per day for ordinary labor and often this does not bring it.

**Pig Iron.**—Bessemer iron has been sold in small lots at \$27, with reports that \$28 has been done; basic at \$23, and No. 2 foundry, \$24, Valley furnace. Sales



## A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Nov. 8, 1916.	Nov. 1, 1916.	Oct. 11, 1916.	Nov. 10, 1915.
No. 2 X, Philadelphia....	\$24.00	\$22.50	\$20.00	\$16.75
No. 2 Valley furnace....	24.00	23.00	20.00	15.25
No. 2 Southern, Cin'ti....	20.90	19.90	17.40	15.90
No. 2 Birmingham, Ala....	18.00	17.00	14.50	13.00
No. 2 furnace, Chicago*	25.00	24.00	19.00	17.00
Basic, del'd. eastern Pa....	25.00	21.50	20.00	17.00
Basic Valley furnace....	23.00	22.00	20.00	15.50
Bessemer, Pittsburgh....	27.95	26.95	23.95	17.45
Malleable Bess., Ch'go*....	25.00	24.00	19.50	17.00
Gray forge, Pittsburgh....	23.95	22.95	20.45	15.45
L. S. charcoal, Chicago..	25.75	20.25	20.75	16.75

Rails, Billets, etc., Per Gross Ton:				
Bess. rails, heavy, at mill	33.00	33.00	33.00	28.00
O.-h. rails, heavy, at mill	35.00	35.00	35.00	30.00
Bess. billets, Pittsburgh..	50.00	50.00	45.00	26.00
O.-h. billets, Pittsburgh..	50.00	50.00	45.00	27.00
O.-h. sheet bars, P'gh....	50.00	50.00	45.00	28.00
Forging billets, base, P'gh	75.00	75.00	69.00	45.00
O.-h. billets, Phila.....	50.00	50.00	50.00	32.00
Wire rods, Pittsburgh....	60.00	60.00	55.00	35.00

### Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Iron bars, Philadelphia....	2.659	2.659	2.659	1.709
O.-h. rails, heavy, at mill	2.85	2.85	2.60	1.50
Iron bars, Chicago.....	2.40	2.40	2.35	1.45
Iron bars, Pittsburgh....	2.75	2.75	2.75	1.60
Steel bars, Pittsburgh....	2.919	2.919	2.919	1.769
Steel bars, New York....	4.00	4.00	4.00	1.60
Tank plates, Pittsburgh..	4.169	4.169	4.169	1.769
Tank plates, New York..	2.75	2.75	2.75	1.60
Beams, etc., Pittsburgh..	2.869	2.869	2.869	1.669
Beams, etc., New York..	2.70	2.70	2.50	1.60
Skelp, grooved steel, P'gh	2.80	2.80	2.60	1.70
Skelp, sheared steel, P'gh	3.00	3.00	3.00	1.75

\*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire,	Nov. 8, 1916.	Nov. 1, 1916.	Oct. 11, 1916.	Nov. 10, 1915.
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	3.50	3.40	3.10	2.20
Sheets, galv., No. 28, P'gh	5.00	4.90	4.25	3.70
Wire nails, Pittsburgh....	2.85	2.70	2.60	1.85
Cut nails, Pittsburgh....	2.80	2.70	2.60	1.80
Fence wire, base, P'gh....	2.80	2.65	2.55	1.70
Barb wire, galv., P'gh....	3.70	3.55	3.45	2.70

### Old Material, Per Gross Ton:

Iron rails, Chicago.....	\$23.00	\$22.00	\$20.00	\$14.50
Iron rails, Philadelphia..	21.00	21.00	21.00	17.50
Carwheels, Chicago.....	16.00	16.00	12.50	13.00
Carwheels, Philadelphia..	17.00	16.50	15.50	14.00
Heavy steel scrap, P'gh..	20.00	19.00	18.00	15.50
Heavy steel scrap, Phila..	17.00	16.50	15.50	14.50
Heavy steel scrap, Ch'go..	19.75	18.75	16.50	12.75
No. 1 cast, Pittsburgh..	17.00	16.00	16.00	13.50
No. 1 cast, Philadelphia..	17.00	16.75	16.00	14.00
No. 1 cast, Ch'go (net ton)	15.00	14.75	13.25	11.75
No. 1 RR. wrot, Phila....	23.50	23.00	22.00	16.00
No. 1 RR. wrot, Ch'go (net)	20.00	19.00	17.50	12.25

### Coke, Connellsville, Per Net Ton at Oven:

Furnace coke, prompt....	\$7.50	\$7.50	\$4.25	\$2.50
Furnace coke, future....	4.00	4.00	3.25	2.50
Foundry coke, prompt....	7.00	7.00	3.50	3.00
Foundry coke, future....	5.00	4.50	4.00	2.75

### Metals,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York..	29.50	29.00	28.50	18.25
Electrolytic copper, N. Y.	29.50	28.50	28.50	18.12½
Spelter, St. Louis.....	10.50	10.37½	9.50	15.75
Spelter, New York.....	10.75	10.62½	9.75	16.00
Lead, St. Louis.....	6.87½	6.90	6.85	5.05
Lead, New York.....	7.00	7.00	7.00	5.15
Tin, New York.....	42.25	41.87½	42.75	36.50
Antimony (Asiatic), N. Y.	12.75	13.00	11.50	36.00
Tin plate, 100-lb. box, P'gh	80.00	55.75	60.00	33.25

during the week were not large, but this is due mostly to the fact that large blocks of Bessemer and basic iron are hard to find. Some consumers of both Bessemer and basic who are not fully covered for first half of 1917 have had offers of \$23 for basic and \$27 for Bessemer turned down. The acute situation in coke, some furnaces having paid as high as \$8 a ton for spot, is adding not a little to the cost of making pig iron, and is partly the reason for the recent heavy advances in prices. We note a sale of 1500 tons and one of 2000 tons of Bessemer at \$27, Valley furnace, with reports of another sale at \$28 at furnace. We also note a sale of 7000 tons of basic to a Shenango Valley consumer at \$23 at maker's furnace. There have been sales of 8000 to 10,000 tons of No. 2 foundry, and probably more, for delivery in first quarter and first half of next year at \$24, Valley furnace. We quote standard Bessemer iron at \$27; basic, \$23; malleable Bessemer, \$24 to \$25; No. 2 foundry, \$24 to \$24.50, and gray forge, \$24, all at Valley furnace, the freight rate for delivery in the Cleveland and Pittsburgh districts being 95c. per ton.

**Ferroalloys.**—One producer and possibly two of Bessemer and silvery ferrosilicon have advanced prices \$2 per ton, and this will likely become general in a few days. However, nearly all consumers are covered over first quarter and first half of next year at lower prices than are ruling now. There is not much new inquiry for ferromanganese, and prices are only fairly steady. We continue to quote 80 per cent English at about \$164, seaboard, but domestic is still being offered at \$160 to \$162 at furnace, the price depending largely on the size of the inquiry. We quote 18 to 22 per cent spiegeleisen at \$50 to \$55, and 25 to 30 per cent at \$65 to \$75, delivered. Nearly all consumers of ferrosilicon are covered for first half of 1917 and some for the entire year, so that the new demand is only fair. We quote 50 per cent ferrosilicon for delivery next year in lots up to 100 tons at \$100; 100 tons to 600 tons, \$99, and over 600 tons, \$98, all per gross ton, f.o.b. Pittsburgh. We quote 9 per cent at \$32; 10 per cent, \$33; 11 per cent,

\$34; 12 per cent, \$35; 13 per cent, \$36.50; 14 per cent, \$38.50; 15 per cent, \$40.50; and 16 per cent, \$43. We quote 7 per cent silvery at \$26.50; 8 per cent, \$27; 9 per cent, \$27.50; 10 per cent, \$28; 11 per cent, \$29; and 12 per cent, \$30. These prices are f.o.b. furnace, Jackson or New Straitsville, Ohio, and Ashland, Ky., all of which have a freight rate of \$2 per gross ton to the Pittsburgh district.

**Billets and Sheet Bars.**—The Potter Title & Trust Company of this city has an inquiry in the market from Eastern interests for 45,000 tons of forging billets for delivery in April, May and June of next year. This inquiry carries British specifications. Intending buyers say it is almost impossible to get Bessemer or open-hearth billets or sheet bars at any price, and there is no doubt that \$55 would be paid if fairly prompt shipment could be made. As many large consumers are getting their billets and sheet bars for this quarter at not over \$50, and some at less, we do not change our quotations, which, however, are largely nominal. The Youngstown Sheet & Tube Company has just authorized the building of three more 100-ton open-hearth furnaces, which will give this company a total of 12 of this size. We quote base sizes and base carbons of Bessemer and open-hearth billets and sheet bars at \$50 to \$55 at mill, Youngstown or Pittsburgh, and forging billets at \$75 for sizes up to but not including 10 x 10-in., and for carbons up to 0.25.

**Plates.**—New orders for steel cars are being placed more freely than for some months. In the past week the New York Central has placed 2000 with the American Car & Foundry Company, 750 with the Ralston Steel Car Company and 1250 with the Barney & Smith Car Company. This road also divided an order for 75 steel passenger coaches among several makers. The Philadelphia & Reading has placed 2000 steel gondolas, the Chesapeake & Ohio, 500 steel hoppers, and the Wabash, 1000 box. The Atlantic Coast Line has placed 1200 box cars and 500 flat cars; the Southern, 1300 steel gondolas; the Erie, 1000 box, and the Chicago, Burlington & Quincy, 500 general service cars, these



orders having been divided among the Standard Steel Car Company, the Pressed Steel Car Company and several other builders. The Cambria Steel Company has taken an order from the Pennsylvania Railroad for 4000 sets of steel car trucks, and the Pressed Steel Car Company is reported to have an order from the Michigan Central for 4000 automobile cars, 1000 steel coal cars and 250 each of stock, ballast and refrigerator cars, this latter being the largest single car order placed in a long time. With the heavy demands on the mills from carbuilders, shipbuilders and other consumers, the supply of plates is far short of being large enough to meet the demand, and mills that can make deliveries in two to four months are able to sell plates at 4.50c. to 5c. One leading mill has entered several contracts for plates for shipbuilding companies for delivery in the second half of 1917 at 4.50c. at mill. The mill price of the Carnegie Steel Company on sheared plates remains at 3.25c., but with no promise whatever as to delivery, and from this the price ranges up to 4.50c. for delivery in second half of next year. For delivery in two to three months, sheared plates have sold at 5c. at mill, and higher prices have been paid for small lots.

**Steel Rails.**—The Carnegie Steel Company is not accepting new contracts for standard sections for delivery before the last quarter of 1917, but for some time only small lots have been placed in this district. The new demand for light rails is active, especially from the coal mining companies. Several large export shipments of rerolled rails have lately been made at higher than domestic prices. We quote 25 to 45 lb. sections at \$47; 16 and 20 lb., \$48; 12 and 14 lb., \$49, and 8 and 10 lb., \$50, in carload lots, f.o.b. at mill, the usual extras being charged for less than carload lots. We quote standard section rails of Bessemer stock at \$33 and of open-hearth \$35, per gross ton, Pittsburgh.

**Structural Material.**—The new inquiry is fairly active, but no large jobs were placed in the past week. The Fort Pitt Bridge Works has taken about 500 tons for extensions to the plant of the Petroleum Iron Works Company, Sharon, Pa., and W. N. Kratzer & Co. have taken 250 tons for extensions to the open-hearth building of the American Steel Foundries, Sharon, Pa. We quote beams and channels up to 15 in. at 2.80c. to 3c. at mill, depending on deliveries, while small lots from stock for fairly prompt shipment are quoted at 3.25c. to 3.50c., Pittsburgh.

**Sheets.**—Late last week the American Sheet & Tin Plate Company and some of the independent mills advanced prices on all grades of sheets \$2 to \$3 per ton, now quoting blue annealed Nos. 3 to 8 at 3.50c. to 3.60c.; Bessemer black, from 3.50c. to 3.65c.; galvanized, 5c. to 5.10c., some mills asking 5.25c. Tin-mill black plate has been advanced about \$2 per ton. The American Sheet & Tin Plate Company is practically out of the market as a seller of sheets for delivery in the first half of 1917, having most of its output under contract, and some independent mills have very little product to sell for first half. The new demand for all grades is abnormally heavy. The output is very heavy, but is still being restricted to some extent by shortage in labor and in steel. Minimum prices now ruling are as follows: Blue annealed sheets, Nos. 3 to 8, 3.50c. to 3.60c.; box annealed, one-pass cold-rolled sheets, No. 28, 3.50c. to 3.65c.; No. 28 galvanized, 5c. to 5.10c., and No. 28 tin-mill black plate, 3.40c. to 3.50c., all f.o.b. Pittsburgh.

**Tin Plate.**—On Monday, Nov. 6, the American Sheet & Tin Plate Company withdrew its price of \$5.75 per base box on bright plate, stating that its entire output of tin plate for the first half of 1917 was sold up and there was no use of carrying a nominal price. This action firmly establishes the tin-plate market at \$6 per base box, the price fixed by the independent mills about a month ago. Practically the entire output for the first half of 1917 is sold, and a large amount has been sold for delivery in the second half, the price to be fixed later. The export demand is heavy, but some of the larger mills say they cannot possibly take on any export business, as they will not have enough tin plate to supply their domestic trade. The Continental Can Company is in the market for a very large quantity of

tin plate, having been unable to cover its full needs from its regular source of supply. Predictions are that before the first quarter of next year has expired tin plate will be on the basis of \$7. We quote bright plate, 14 x 20, at \$6 per base box, f.o.b. Pittsburgh, for delivery in first half of 1917.

**Shafting.**—It is said that nearly all large consumers of shafting have covered their needs for the first quarter and first half of next year, these contracts having been placed on the basis of 20 per cent off list and a few at 15 per cent off. An item of interest is that some makers of shafting have caught up to some extent on deliveries, one leading maker now being able to ship out in six to seven weeks from date of order; but another large maker says it has five months' work ahead. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots and 10 per cent off in less than carload lots for first quarter and first half of 1917, f.o.b. Pittsburgh, freight added to point of delivery.

**Wire Products.**—On Saturday, Nov. 4, the American Steel & Wire Company sent out notices of an advance of \$3 per ton in all wire products, and at the same time lowered discounts on woven wire fencing three points, an advance of about \$6 per ton. This action was followed on Monday by all independent mills, so that wire nails are now firmly established at \$2.85 and bright basic wire \$2.90 per 100 lb. The domestic demand is extraordinarily heavy, and any mills that could ship nails or wire fairly promptly could likely secure premiums over even the present high prices. There is a shortage in the supply of wire nails, mills being sold up for three to four months, and customers report deliveries unsatisfactory. Prices in effect from Monday, Nov. 6, are as follows: Wire nails, \$2.85, base, per keg; galvanized, 1 in. and longer, including large head barbed roofing nails, taking an advance over this price of \$2, and shorter than 1 in., \$2.50. Bright basic wire is \$2.90 per 100 lb.; annealed fence wire, Nos. 6 to 9, \$2.80; galvanized wire \$3.50; galvanized barb wire and fence staples, \$3.70; painted barb wire, \$3.00; polished fence staples, \$3.00; cement-coated nails, \$2.75, base, these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing are 55 per cent off list for carload lots, 54 per cent for 1000-rod lots and 53 per cent for small lots, f.o.b. Pittsburgh.

**Railroad Spikes and Track Bolts.**—Makers continue to report the new demand for railroad spikes dull, and say they are running as few machines as possible, preferring to put the steel into other products for which the demand is heavy and prices are high. At 2.65c., railroad spikes are lower than steel bars. The new demand for track bolts is also quiet, but makers say prices are very firm and should be higher. We quote track bolts with square nuts at 4.50c. to 4.75c. to railroads and 5c. to 5.25c. in small lots to jobbers, base. Track bolts with hexagon nuts take the usual advance of 15c. per 100 lb. Prices on spikes are as follows:

Standard railroad spikes,  $4\frac{1}{2}$  x 9/16 in. and larger, \$2.65 to \$2.75; railroad spikes,  $\frac{1}{2}$  to 7/16 in., \$2.75 base; railroad spikes,  $\frac{3}{4}$  in. and 5/16 in., \$3.05 base; boat spikes, \$2.80 base, all per 100 lb., f.o.b. Pittsburgh.

**Rivets.**—Makers report the new demand heavy. Consumers are now covering their needs for the first quarter and in some cases the first half of 1917. The export demand is heavy, especially from Africa and India. Due to the higher market on steel bars, an advance in rivets may be made in the next week or ten days. Makers' quotations are: Buttonhead structural rivets,  $\frac{1}{2}$  in. in diameter and larger, \$4 per 100 lb., base, and conehead boiler rivets, same sizes, \$4.10 per 100 lb., base, f.o.b., Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

**Iron and Steel Bars.**—The minimum price on steel bars remains at 2.70c. at mill, with no definite promise as to deliveries. Some makers are quoting 2.75c. to 2.85c., and have entered orders at the higher price for delivery in the second quarter. Most large consumers have covered for the first half of next year, and the two leading makers of steel bars report their output

sold up for the first half with some obligations on their books for the third quarter. There are still heavy export inquiries for steel rounds, and fabulous prices have lately been paid, 4.50c. having been reported. Deliveries on steel bars by the mills are much behind, and with the car and labor shortage this condition is likely to be worse. We quote merchant steel bars at 2.70c. at mill for indefinite delivery, and 2.75c. to 2.85c. for specified deliveries in the second and third quarters of next year. The demand for iron bars is heavy and prices are very strong. We quote refined iron bars at 2.85c. to 2.90c., and railroad test bars, 2.90c. to 3c., f.o.b., Pittsburgh.

**Cold-Rolled Strip Steel.**—Makers are now covering their customers for delivery in the first quarter of next year, and it is said that none will sell for delivery beyond that period, owing to the uncertainty as to prices of raw materials and the labor supply. The minimum price on cold-rolled strip steel for first quarter delivery is \$6.50, base, per 100 lb. There is some export demand, but local makers say they have all they can do to take care of the needs of domestic customers. We quote on contracts for first quarter delivery \$6.50 to \$7, while on small lots for fairly prompt shipment, from \$7 to \$7.50 is quoted. Terms are 30 days net, less 2 per cent off for cash in 10 days, delivered in quantities of 300 lb. or more when specified for at one time.

**Merchant Steel.**—The new demand is extremely heavy and customers report that deliveries from the mills are unsatisfactory. For fairly prompt shipment premiums over regular prices would readily be paid. Prices are likely to be higher, owing to the increased cost of labor and materials and the shortage of cars. On small lots we quote: Iron-finished tire,  $\frac{1}{2}$  x  $1\frac{1}{2}$  in. and larger, 2.75c., base; under  $\frac{1}{2}$  x  $1\frac{1}{2}$  in., 2.85c.; planished tire, 2.90c.; smooth channel tire,  $\frac{3}{4}$  to  $\frac{1}{2}$  and 1 in., 3c. to 3.10c.;  $1\frac{1}{2}$  in. and larger, 3.10c.; toe calk, 3.25c. to 3.50c., base; flat sleigh shoe, 2.75c.; concave and convex, 2.85c.; cutter shoes, tapered or bent, 3.50c. to 3.75c.; spring steel, 4c. to 4.10c.; machinery steel, smooth finished, 3.10c. to 3.25c., all f.o.b. at mill.

**Nuts and Bolts.**—Makers report the new demand better and say they are still having much trouble in getting deliveries of steel. Premiums are readily paid by consumers for fairly prompt shipments. Not much attention is paid to the export demand, as makers say they are having trouble to take care of the domestic trade. Discounts are as follows, delivered in lots of 300 lb. or more, where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days.

Carriage bolts, small, rolled thread, 50 and 5 per cent; small, cut thread, 40, 10 and 5 per cent; large, 35 and 5 per cent.

Machine bolts, h. p. nuts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50 per cent; large, 40 and 5 per cent.

Machine bolts, c. p. c. and t. nuts, small, 40 and 10 per cent; large, 35 per cent. Blank bolts, 40 and 5 per cent. Bolt ends, h. p. nuts, 40 and 5 per cent; with c. p. nuts, 35 per cent. Rough stud bolts, 15 per cent. Lag screws (cone or gimlet point), 50 and 5 per cent.

Forged set screws and tap bolts, 10 per cent. Cup and round point set screws, case-hardened, 60 per cent. Square or hexagon head cap screws, 55 per cent. Flat, button, round or fillister head cap screws, 30 per cent.

Nuts, h. p. sq., tapped or blank, \$2.70 off list; hex., \$2.70 off. Nuts, c. p. c. and t. sq., tapped or blank, \$2.40 off; hex., \$2.80 off. Semi-finished hex. nuts, 60 and 5 per cent. Finished and case-hardened nuts, 60 and 5 per cent.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 5 per cent.

**Hoops and Bands.**—The demand is heavy, but most large consumers are covered through the first quarter and first half of next year. The nominal price of the Carnegie Steel Company on hoops is 3c., and bands, 2.70c., but with no promise of delivery. Other makers quote steel hoops as high as 3.25c. and steel bands at 3c. for specified delivery.

**Wire Rods.**—There is a runaway market in wire rods, the supply being limited and the new demand heavy. One local maker has sold soft rods, either Bessemer or open-hearth, at \$65 a ton at mill, and the buyer was glad to get them. High carbon rods have been quoted from \$75 to \$85, and one sale is reported

to have been made at close to \$70 at mill. We quote soft Bessemer, open-hearth and chain rods at \$60 to \$65 per gross ton, f.o.b. Pittsburgh, but it would be hard to find rods at the lower price.

**Wrought Pipe.**—A leading mill in the Wheeling district has taken an order for 120 miles of 6 and 8 in. line pipe for delivery to an Oklahoma oil interest. The Texas Gas Company is in the market for 10 miles of 6-in. All the pipe mills are refusing to quote to any but regular customers, and on lap-weld sizes the leading interest reports it has its output sold up for about eight months. The Jones & Laughlin Steel Company, which came in the market recently as a maker of lap and butt weld pipe, is reported to be in shape to make fairly prompt deliveries. On butt-weld sizes, mills can ship out in three to four weeks. The Wheeling Steel & Iron Company last week lowered discounts on lap-weld steel pipe three points, an advance of \$6 per ton, and on butt weld, one point, an advance of \$2 per ton. Discounts on black and galvanized iron and steel pipe in effect from Nov. 1, 1916, are given on another page.

**Boiler Tubes.**—Local makers are sold up on locomotive and merchant iron and steel tubes to July 1, 1917, or longer, and on seamless steel tubing have their entire output sold up for all of next year. Any mills that are in position to make fairly prompt deliveries on either locomotive or merchant tubes have no trouble in getting premiums over regular prices. Discounts are given on another page.

**Old Material.**—Signs are that scrap is finally coming into its own, it being the last material to respond to the much higher prices ruling on other products. In the past week selected heavy steel scrap is reported to have sold at close to \$21, delivered. Borings and turnings are up fully \$1 per ton, and low phosphorus melting stock is also higher. Not a very large amount of scrap is being bought by consumers, but the available supply is light. Dealers are afraid to sell short, while those who have scrap piled in their yards are strongly inclined to hold it for higher prices. The market shows every sign of being higher in the very near future. A sale of 2000 tons of selected heavy steel scrap is reported at \$20.50, and another sale of a larger amount at \$21, the latter for delivery to a consumer in the Youngstown district. Prices now being quoted by dealers for delivery in Pittsburgh and points that take the same rates of freight, per gross ton, are as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	\$20.00 to \$21.00
No. 1 foundry cast	16.50 to 17.00
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	22.00 to 23.00
Hydraulic compressed sheet scrap	15.50 to 16.00
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	13.00 to 13.50
Bundled sheet stamping scrap	13.00 to 13.50
No. 1 railroad malleable stock	16.50 to 17.00
Railroad grate bars	12.00 to 12.50
Low phosphorus melting stock	23.00 to 24.00
Iron car axles	42.00 to 43.00
Steel car axles	42.00 to 43.00
Locomotive axles, steel	43.00 to 44.00
No. 1 busheling scrap	15.50 to 16.00
Machine-shop turnings	8.50 to 9.00
Old carwheels	16.50 to 17.00
Cast-iron borings	10.00 to 10.50
*Sheet bar crop ends	21.00 to 22.00
No. 1 railroad wrought scrap	20.50 to 21.00
Heavy steel axle turnings	12.50 to 13.00
Heavy breakable cast scrap	15.00 to 15.50

\*Shipping point.

**Coke.**—The market has quieted down to some extent. Furnace operators that have not covered on their supply of furnace coke for first half of next year say they are not going to pay \$4 per ton for coke, but will hold off. Some consumers of furnace coke who covered their needs for the first half several months ago at \$2.30 to \$2.50 are now getting a little nervous over these contracts, wondering whether they will get the coke when they need it, in view of the fact that other producers will get \$3.75 or \$4, or more, for their coke for the same delivery. Very high prices continue to rule on coal, and as long as these last, there is not likely to be a serious decline in the price of coke. The new demand for prompt blast-furnace coke is not so active as it was, but prices are firm on the basis of about \$7.50 per net ton at oven, and we note a sale of



20 cars made on Monday at that price. No pressing inquiries are in the market for furnace coke for first half delivery. We quote best grades of Connellsville furnace coke for prompt shipment at \$7 to \$7.50, and on contracts for first half of 1917 at \$3.75 to \$4 per net ton at oven. A contract for 10,000 tons of blast-furnace coke per month for first half of 1917 is reported at \$4 per net ton. We quote best grades of 72-hr. foundry coke at \$7 to \$8 per net ton for spot shipment, and on contracts at \$4.50 to \$5 per net ton at oven. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended Oct. 28 as 430,331 net tons, an increase over the previous week of 32,235 tons. This is the largest increase shown in any one week for some months.

## Chicago

CHICAGO, ILL., Nov. 7, 1916.

The buying of cars, of rails and track fastenings and of bars by the implement manufacturers stands out as the prominent activity of the week in rolled steel products. Over 12,000 cars have been bought, for which close to 100,000 tons of steel have been placed on mill books. Nearly 100,000 tons of rails, for delivery in 1917, were placed, of which 50,000 tons for France and 30,000 tons for a transcontinental line of the Northwest were the large items. The implement makers have been adding to previous purchases of bars and the aggregate of a large number of orders runs up to 40,000 tons. With respect to prices, the market is in an almost feverish condition, with quotations on contracts for plates, for the last half of 1917, as high as 4.60c., with black sheets at a minimum of 3.65c., and running up to 4.25c., galvanized sheets as high as 6c., and wire products up \$3 per ton. The bar-iron mills have very little to sell at 2.40c. and for rail-carbon steel, 2.60c. is being asked, with a further prospective advance of \$3 per ton. Store prices also have been advanced for shapes, plates, sheets and bars. There has been heavy contracting in bolts and nuts. The scarcity of pig iron now available at any price is keeping the market on edge even though the volume of inquiry is less. Prices are still moving upward and there is practically no Northern iron to be had at less than \$25 at Chicago furnace, while from \$21 to \$21.50 at Birmingham has been realized on recent sales of Southern iron. Charcoal-iron quotations have been moved up correspondingly. The advance in prices of scrap are exceeding expectations, and in view of the great scarcity of some grades are likely to run to still higher levels. Cast-iron pipe, for which there is inquiry at Chicago amounting to 18,000 tons, has also been put up \$1 per ton.

**Rails and Track Supplies.**—Heavy bookings of rails were a feature of the week, an order coming from France for 50,000 tons, which, with the closing of requirements of the Great Northern for 30,000 tons and the placing of 5000 tons each by the Soo Line and the St. Louis & Southwestern, brought the total close to 100,000 tons. The one railroad also contracted for track fastenings, including 15,000 kegs of spikes, 8000 kegs of bolts and 7000 tons of tie plates. It is understood that no consideration is being given by the mills to rails for 1918 delivery and there is no important inquiry of this nature reported. Quotations are as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie plates, \$52 to \$54, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, \$33, base; open-hearth, \$35; light rails, 25 to 45 lb., \$40; 16 to 20 lb., \$41; 12 lb., \$42; 8 lb., \$43; angle bars, 2c., Chicago.

**Pig Iron.**—The principal seller of pig iron at Chicago, with but little iron of any grade remaining to be sold, is asking a minimum of \$25 at the furnace for foundry, malleable and basic iron. Selling continued actively throughout last week, one transaction at \$24.50 for 5000 tons of basic iron indicating the course of the market. In the past few days there have been sales of standard Bessemer at \$27.50, Chicago, while other quo-

tations have run as high as \$29. An important steel foundry interest is still in the market for 5000 tons of Bessemer. At the end of last week some Southern iron was still available on the basis of \$18, Birmingham, but two producers quoting that price have since withdrawn from the market, and subsequent sales have been at prices \$3 per ton higher. The charcoal-iron interests are understood to have put their prices up from \$3 to \$5 per ton and \$25.75, Chicago, is not now out of line. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of \$1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5...	\$25.75 to \$26.25
Lake Superior charcoal, No. 1.....	26.25 to 26.75
Lake Superior charcoal, No. 6 and Scotch .....	26.75 to 27.25
Northern coke foundry, No. 1.....	25.50
Northern coke foundry, No. 2.....	25.00
Northern coke foundry No. 3.....	24.50
Northern high phosphorus foundry...	24.00 to 24.50
Southern coke No. 1 f'dry and 1 soft	24.50 to 25.00
Southern coke, No. 2 f'dry and 2 soft	24.00 to 24.50
Malleable Bessemer .....	25.00
Basic .....	25.00
Low phosphorus .....	40.00
Silvery, 8 per cent .....	34.50 to 35.50
Bessemer ferrosilicon, 10 per cent...	40.50 to 42.50

**Structural Material.**—Car builders last week closed with the railroads for a total of more than 12,000 cars. The Haskell & Barker Car Company will build 450 refrigerators for Morris & Co. and 500 box for the Duluth, South Shore & Atlantic; the American Car & Foundry Company, 1500 box for the Union Pacific, 400 ballast for the Illinois Central and 1500 box for the Chicago & Northwestern; the Bettendorf Company, 500 refrigerators for Morris & Co.; the Mount Vernon Car & Mfg. Company, 750 underframes for the Louisville & Nashville; the Standard Steel Car Company, 1000 gondolas for the Illinois Central, 1000 box for the Erie and 1000 gondolas for the New York Central Lines, the last two items having been mentioned as placed a week ago; the Barney & Smith Car Company, 500 stock for the Chicago & Northwestern, and the Western Steel Car & Foundry Company, 3000 cars, of which 1500 are understood to be for the Chicago, Burlington & Quincy. Other cars for which negotiations are still pending include 300 ore cars for the Northern Pacific, 2000 hoppers for the Chesapeake & Ohio, 600 gondolas for the Illinois Central, 1000 box for the Pere Marquette, 2000 box for the New York Central Lines, 1000 stock for the Missouri, Kansas & Texas and 1000 automobile cars for the San Pedro, Los Angeles & Salt Lake City. For the cars that have been placed a total of nearly 100,000 tons of shapes, plates and bars is estimated to have been booked. Contracts for structural steel for building purposes were small except for 3000 tons awarded to the American Bridge Company for the terminal freight-house of the Chicago, Burlington & Quincy Railroad at Chicago. We quote for Chicago delivery of structural steel from mill 2.989c.

The price of structural steel from store has been advanced \$2 per ton and we quote for Chicago delivery from jobbers' stocks 3.35c.

**Plates.**—Sellers of plates report little or no falling off in the inquiry for plates in all sizes. For prompt shipment of tank plate in average widths, 3.75c., Pittsburgh, is being regularly done, and for wide plates, practically no orders can be placed at less than 4.50c., prices in some instances running to 5c. Buyers seeking to place contracts for plates in the last half of next year have been quoted 4.60c., but few plate makers are interested in business that far ahead. We quote for Chicago delivery of plates from mill at its convenience 3.439c. For prompt shipment, we quote 3.689c. to 3.939c. in widths up to 72-in., and for wide plates 4.439c. to 4.689c.

An advance of \$5 per ton has been announced in the price of plates out of store and we quote for Chicago delivery from jobbers' stock 4c.

**Sheets.**—A general advance in the price of sheets has been made by all of the mills with the leading interest quoting as a minimum 3.65c., Pittsburgh, for



one-pass Bessemer sheets and 3.85c. for open hearth. Other mills are quoting as high as 4.25c., for No. 28 black and in galvanized sheets, business has been transacted on the basis of 6c., Pittsburgh. In view of the number of mills that are not quoting on any business, inquiry is more than equal to the offerings by the remaining makers. We quote, for Chicago delivery, blue annealed, No. 16 and heavier, 3.439c. to 3.589c.; box annealed, No. 17 and lighter, 3.839c. to 3.939c.; No. 28 galvanized, 5.689c. to 6c.

We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.65c.; No. 28 black, 3.90c. to 4c.; No. 28 galvanized, 5.40c. to 5.50c.

**Bars.**—The past two weeks have brought out a general buying of bars by the implement interests. Individual orders have not been noticeably large, but there has been a general augmenting of tonnages under contract, with the result that approximately 40,000 tons has been recently closed. The advancing prices of scrap, of coal and of labor are firming up the prices for both iron and rail-carbon steel bars. Some business is still being done in bar iron at 2.40c., Chicago, but quotations are more frequently higher; while for rerolled steel an advance of \$2 per ton has already been made and a further advance is contemplated. Sales of bar iron in October mounted almost to record figures, but for high-carbon steel bars the demand is still only moderate. We quote mill shipment, Chicago, as follows: Bar iron, 2.40c. to 2.50c.; soft steel bars, 2.889c.; hard steel bars, 2.60c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.35c.; bar iron, 3.35c.; reinforcing bars, 3.35c. base with 5c. extra for twisting in sizes  $\frac{1}{2}$  in. and over and usual card extras for smaller sizes; shafting net list.

**Rivets and Bolts.**—Contracting by the implement interests, by the railroads and by hardware jobbers has been specially active, the railroads having still to close a number of contracts under negotiation. Buying by jobbers in particular is indicative of the change in sentiment, and the permanence of high prices now seems to be generally accepted. We quote as follows: Carriage bolts up to  $\frac{3}{4}$  x 6 in., rolled thread, 50-5; cut thread, 40-10-2 $\frac{1}{2}$ ; larger sizes, 35-2 $\frac{1}{2}$ ; machine bolts up to  $\frac{3}{4}$  x 4 in., rolled thread, with hot pressed square nuts, 50-10; cut thread, 50; large size, 40-5; gimlet-point coach screws, 50-5; hot pressed nuts, square, \$2.70 off per 100 lb.; hexagon, \$2.70 off. Structural rivets,  $\frac{3}{4}$  to 1 $\frac{1}{2}$  in., 4c. to 4.15c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Store prices for rivets have been advanced and we quote as follows: Structural rivets, 4.25c.; boiler rivets, 4.35c.; machine bolts up to  $\frac{3}{4}$  x 4 in., 50; larger sizes, 40-5; carriage bolts up to  $\frac{3}{4}$  x 6 in., 40-10; larger sizes, 35-5; hot pressed nuts square, \$3, and hexagon, \$3 off per 100 lb.; lag screws, 50-5.

**Cast-Iron Pipe.**—The City of Chicago is advertising for bids on 18,000 tons, but this is the only important inquiry in this territory. Prices of pipe have been advanced \$1 per ton. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$35.50; 6 in. and larger, \$32.50, with \$1 extra for Class A water pipe and gas pipe.

**Wire Products.**—An advance of \$3 per ton has been announced by the leading wire interest on wire nails, plain and barb wire, and also a three-point advance for fencing. The principal interest is assuming a markedly conservative attitude in the matter of further selling, in consequence of the general concern regarding manufacturing conditions now so seriously threatened by fuel and car shortage. We quote as follows per 100 lb.: Plain wire, Nos. 6 to 9, base, \$3.089; wire nails, \$3.039; painted barb wire, \$3.189; galvanized barb wire, \$3.889; polished staples, \$3.189; galvanized staples, \$3.889; all Chicago.

**Old Material.**—Prices of scrap are moving upward without check. Astonishing advances of from \$1 to \$3 per ton are noted. All grades of old material emanating from the railroads or requiring fabrication are scarce, and are being quoted at abnormally high prices. Rerolling rails in particular are difficult to secure, one railroad selling last week at \$24.50 and another at \$25.

In some instances relaying rails have been purchased for rerolling purposes, with a resultant sharp advance in their price. With the price level of heavy melting steel as high as it is and the supply as limited, short rails are in exceptional favor. Wrought scrap and busheling also show substantial advances. Railroad offerings of scrap are again small, and include 850 tons from the Vandalia, 2000 tons from the Wabash, 1600 tons from the Pere Marquette and 500 tons from the Soo Line. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	\$23.00 to \$24.00
Relaying rails	24.00 to 25.00
Old carwheels	16.00 to 16.50
Old steel rails, rerolling	24.50 to 25.00
Old steel rails, less than 3 ft.	22.50 to 23.00
Heavy melting steel scrap	19.75 to 20.00
Frogs, switches and guards, cut apart	20.00 to 20.50
Shoveling steel	19.00 to 19.50
Steel axle turnings	10.00 to 10.50

Per Net Ton	
Iron angles and splice bars	\$22.50 to \$23.00
Iron arch bars and transoms	24.50 to 25.00
Steel angle bars	18.50 to 19.00
Iron car axles	33.00 to 34.00
Steel car axles	37.50 to 38.00
No. 1 railroad wrought	20.00 to 20.50
No. 2 railroad wrought	19.00 to 19.50
Cut forge	19.00 to 19.50
Pipes and flues	14.00 to 14.50
No. 1 busheling	16.00 to 16.50
No. 2 busheling	11.50 to 12.00
Steel knuckles and couplers	19.50 to 20.00
Steel springs	20.00 to 20.50
No. 1 boilers, cut to sheets and rings	12.50 to 13.00
Boiler punchings	17.50 to 18.00
Locomotive tires, smooth	24.75 to 25.25
Machine-shop turnings	7.00 to 7.50
Cast borings	7.25 to 7.75
No. 1 cast scrap	15.50 to 16.00
Stove plate and light cast scrap	12.25 to 12.75
Grate bars	12.00 to 12.50
Brake shoes	12.00 to 12.50
Railroad malleable	16.00 to 16.50
Agricultural malleable	14.00 to 14.50

## Philadelphia

PHILADELPHIA, PA., Nov. 6, 1916.

The excited condition of the pig-iron market continues the dominant feature. The minimum for eastern Pennsylvania No. 2 X appears to be \$24, furnace, with the producers backward about selling at that level. Over 20,000 tons of basic has been purchased at \$25 to \$25.50, delivered. Consumers show unabated zeal in endeavoring to cover 1917 requirements. Virginia No. 2 X is quoted at \$24, furnace, equal to \$26.75, Philadelphia. A prominent plate mill is so filled with business that it has raised its quotation for tank plates to 4.75c., Pittsburgh base. J. P. Morgan is in the market for 50,000 tons of structural shapes, for which one producer now quotes 3c., Eastern mill. The demand for car material is extremely strong, indicating that the carbuilders have abandoned hope of lower prices and intend to cover their needs at present levels. Local mills are not yet showing any interest in heavy melting steel, but its quotation is strengthened by the big demand in the West. Meanwhile rolling mills and foundries are active buyers, and the old material market shows a general upward trend in prices. The spot coke situation is more serious than ever, prominent makers having withdrawn all offerings.

**Pig Iron.**—The market is active, with consumers pressing to buy to a considerable extent into the last half of 1917, despite the fact that minimum prices for No. 2 X are close to \$25, delivered. Up to \$27.50 is quoted. A few weeks ago the optimistic among the trade were predicting \$25 iron, and now that this level has arrived they are asserting that the price will go to \$30. Notwithstanding all the talk of a shortage, iron is available in several directions, but the holders are reluctant to sell, feeling that prices even more advantageous than those prevailing will be obtainable later. Many large buyers in recent weeks have quietly covered their requirements and this fact, together with the absorption of iron for export, is responsible for the situation. Basic is firmly on the \$25 level. A Phoenixville interest has taken about 22,000 tons of eastern Pennsylvania basic, in two lots, at \$25 to \$25.50, delivered, 12,000 tons going for the lower price. Makers who last week asked \$23 furnace, for No. 2 X foundry

have advanced their furnace price to \$24 and many sales have been made at this level for future delivery, the freight rate in one instance being 79c., but they make it understood that they are not anxious to sell at this price. A large Buffalo producer has withdrawn from the market for any delivery. Late last week the largest producer of Virginia iron, which has been out of the market entirely, announced that orders would be accepted at \$22, furnace, or \$24.75, Philadelphia, for No. 2 X. So much business came in that this maker subsequently advanced his price to \$24, furnace, or \$26.75, Philadelphia. Buying of Virginia brands is not as heavy as it was, but this is to be expected in view of the great tonnage recently booked. Practically no prompt or first half is available. Southern iron is equally strong at \$19 to \$20, Birmingham, some makers having only second-half to sell. They have heavy commitments for export. Inquiries from abroad continue to appear, but some of them are sadly lacking in detail as to the character of iron wanted, one such inquiry for 5000 to 10,000 tons for export to Sweden merely asking for American pig iron. Standard low phosphorus is active and stronger at \$43 to \$45, delivered. Copper bearing low phosphorus is quoted at \$38, furnace, with sales reported at \$40, furnace. Quotations for standard brands delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa. No. 2 X foundry.....	\$24.00 to \$25.00
Eastern Pa. No. 2 plain.....	23.50 to 24.50
Virginia No. 2 X foundry.....	26.75
Virginia No. 2 plain.....	26.50
Gray forge.....	22.50 to 23.00
Basic.....	25.00 to 25.50
Standard low phosphorus.....	43.00 to 45.00

**Iron Ore.**—The only arrival of foreign ore reported at this port in the week ended Nov. 4 consisted of 7600 tons from Cuba. The foreign ore business continues dormant. A moderate quantity of Lake Superior ore for delivery this year is offering.

**Ferroalloys.**—In English 80 per cent ferromanganese there is no change, first half material being obtainable at \$164, seaboard. The prompt situation is in the hand of domestic makers, who are asking \$165, but might scale their price down to \$162.50. Spiegeleisen, 19 to 21 per cent, is quoted at \$45, delivered, with a possibility of \$44 being done. For 11 per cent blast-furnace ferrosilicon, some makers are asking \$44.44. Standard 50 per cent ferrosilicon is about \$100, Pittsburgh. Last week 210 tons of English ferromanganese arrived here.

**Plates.**—One of the more prominent eastern Pennsylvania plate mills has advanced its base price for tank plates to 4.75c., Pittsburgh, or 4.909c., Philadelphia, and asks 10.40c., Pittsburgh, for marine boiler steel. For ship plates it asks 5c. to 5.50c., Pittsburgh. It has found the car builders anxious to contract for material as far ahead as possible, and would soon be swamped if it took all the business offered. Universal plates are rapidly becoming as tight as sheared plates. Under a terrific pressure this mill is hampered by a lack of men and other detriments to increased output. A large part of the ship plate demand is coming from the vessels which Norwegians are having built in this country. Another mill which asks 4.50c., Pittsburgh, or 4.659c., Philadelphia, for ship plates, in the past week booked about 25,000 tons. Its quotation for tank plates is 4.159c., Philadelphia, but it is no secret that this price can be shaded.

**Bars.**—While some makers will supply steel bars to their regular customers on the basis of 2.70c., Pittsburgh, or 2.859c., Philadelphia, others quote 3.009c. to 3.159c., Philadelphia. Iron bars are moving actively at the unchanged price of 2.659c., Philadelphia, carload lots.

**Structural Material.**—J. P. Morgan & Co., purchasing agents for Great Britain, are in the market for about 50,000 tons of shapes, limited to few sizes. One mill, which like the others, has but little to sell, quotes 3.009c. for structurals and 3.659c. for ship shapes. Another producer abandoned the 2.85c., Pittsburgh base last week, and now quotes 3c., Eastern mill. The demand is strong, coming from jobbers, shipbuilders, railroads and carbuilders, all wanting plain material.

No fabricated propositions are under consideration by the mills.

**Billets.**—The domestic demand for billets is developing more strongly than that for export, and it is believed that foreign consumers will seek finished rather than raw material from this time on. Discarded shell steel is scarce. Open-hearth rerolling billets are strong at \$50 to \$55, and high carbon billets at \$65 to \$75.

**Sheets.**—The market continues active and strong. No. 10 blue annealed are quoted at 3.409c. to 3.759c., Philadelphia.

**Coke.**—No relief is in sight so far as spot fuel is concerned, while the producers are not willing to contract with prompt prices soaring. High as prices are, one or two coke producers have withdrawn from the market. Prompt foundry has been quoted at \$9 to \$9.50 per ton, and contract at \$5 to \$6 per net ton at oven. Spot furnace is \$7.25 to \$7.75 per net ton at oven, and contract, nominally \$3.75 to \$4. Freight rates from the principal producing districts are as follows: Connellsville, \$2.05; Latrobe, \$1.85, and Mountain, \$1.65.

**Old Material.**—Buying by the rolling mills has been good and the foundries are active, but the mills refrain from entering the market for heavy melting steel. The market is strong, and its strength augmented by demand from the West and a tendency on the part of those having scrap to hold it more tightly. Turnings and borings are strong, and advances are predicted. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$17.00 to \$17.50
Old steel rails, rerolling.....	21.00 to 22.00
Low phos. heavy melting steel scrap.....	23.50 to 24.50
Old steel axles (for export).....	35.00 to 36.00
Old iron axles (for export).....	35.00 to 36.00
Old iron rails.....	21.00 to 22.00
Old carwheels.....	17.00 to 17.50
No. 1 railroad wrought.....	23.50 to 24.00
Wrought-iron pipe.....	16.50 to 17.00
No. 1 forge fire.....	13.50 to 14.00
Bundled sheets.....	12.50 to 13.00
No. 2 busheling.....	10.50 to 11.00
Machine-shop turnings.....	9.50 to 10.00
Cast borings.....	10.50 to 11.00
No. 1 cast.....	17.00 to 17.50
Grate bars, railroad.....	14.00 to 14.50
Stove plate.....	14.00 to 14.50
Railroad malleable.....	15.00 to 16.00

## Cleveland

CLEVELAND, OHIO, Nov. 7, 1916.

**Iron Ore.**—Ore shipments during October amounted to 9,116,096 gross tons, making the total Lake movement up to Nov. 1, 57,932,746 tons. It is now practically sure that the movement for the season will be close to 64,000,000 tons, or somewhat larger than estimates earlier in the season. It is expected that the November movement will amount to 6,000,000 and some ore will be moved in December. Shippers are taking all the available vessel room and some will load ore as long as the weather permits. Less interest is being shown in the ore market for next year than was the case a month ago, owing to the fact that a large share of the consumers have made reservations for their 1917 requirements and need show no further anxiety over their ore supply. No important developments have appeared in the price situation although there apparently is no longer any doubt that the advance in ore prices will be at least \$1 a ton and it may be slightly more than \$1 for Bessemer ores. The advance in the vessel rate will probably be to \$1 a ton. Lake Erie docks on Nov. 1 held 8,793,586 gross tons of ore, an increase of 1,763,562 tons over the balance on Oct. 1. The large increase in ore placed on the docks was due partly to the car shortage which prevented considerable ore from going directly to the furnaces. The dock balance on Dec. 1 will probably break all former records. We quote 1916 prices as follows, delivered lower Lake ports: Old range Bessemer, \$4.45; Mesaba Bessemer, \$4.20; old range non-Bessemer, \$3.75; Mesaba non-Bessemer, \$3.55.

**Pig Iron.**—Prices continue to advance on all grades. Some lots of Bessemer iron have been sold by Valley furnaces at \$27 for first half delivery and we note the



sale of a round lot of basic iron for the last half of next year by a Valley interest at close to \$23.50. Foundry and malleable grades have been advanced to from \$24 to \$25, Cleveland, Toledo and Valley furnaces, and the same prices are being asked for basic. Some small-lot sales of foundry iron are reported at \$25 by Cleveland and Valley furnaces. Considerable inquiry is coming out for iron for both first and last half. Little Northern iron is now available for first half delivery, most furnaces having booked orders for as much as they feel they can safely take on for that delivery. Southern iron has sold up to \$20, Birmingham, for No. 2. Some producers are entirely sold up and have withdrawn from the market for the first half and are quoting the high prices for the last half. Several sales were made last week at \$18, Birmingham, for No. 2 for first half delivery. Ohio silvery is quoted at \$30 for delivery through both the first and last half of next year. The United Furnace Company, Canton, Ohio, has completed its new stack and will begin making basic iron next week for its allied interest, the United Alloy Steel Corporation. We quote, delivered Cleveland, as follows:

Bessemer .....	\$27.95
Basic .....	\$24.30 to 24.50
Northern No. 2 foundry.....	24.30 to 25.30
Southern No. 2 foundry.....	24.00
Gray forge .....	23.95
Jackson Co., silvery, 8 per cent silicon.....	31.62
Standard low phos., Valley furnace....	40.00 to 41.00

**Coke.**—We note the sale of 250 tons of foundry coke for prompt shipment at \$11 per net ton at oven for immediate delivery, but the usual quotation for standard Connellsville brands for prompt shipment is \$8 to \$8.25. Some furnace coke for prompt shipment has been obtained at \$7, but the usual quotation is \$7.50 to \$8. For contract Connellsville furnace coke is quoted at \$3.75 to \$4. Many producers are sold up and will not quote on foundry grades for contract.

**Bolts, Nuts and Rivets.**—The demand for bolts and nuts is heavy, and with the \$3 a ton advance in wire products a price advance is expected shortly. A large amount of business is being booked in first quarter and first half contracts. Outstanding quotations on rivets are being withdrawn, and there is a probability that the present prices of 4c., Pittsburgh, for structural and 4.10c. for boiler rivets will be advanced. Rivet specifications are heavy. Bolt and nut discounts are as follows:

Common carriage bolts,  $\frac{3}{4}$  x 6 in., smaller or shorter, rolled thread, 50 and 5; cut thread, 40, 10 and  $2\frac{1}{2}$ ; larger or longer, 35 and  $2\frac{1}{2}$ ; machine bolts within h. p. nuts,  $\frac{3}{4}$  x 4 in., smaller and shorter, rolled thread, 50 and 10; cut thread, 50; larger and longer, 40 and 5; lag bolts, gimlet or cone point, 50 and 5; square h. p. nuts, blank or tapped, \$2.70 off the list; hexagon h. p. nuts, blank or tapped, \$2.70 off; c. p. e. and t. sq. nuts, blank or tapped, \$2.40; hexagon nuts, all sizes, \$2.80 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 5.

**Finished Iron and Steel.**—The demand for steel for early shipment continues very heavy, and there is a large volume of inquiry for first half contracts. Ohio tank shops are making considerable plate purchases at 4c., Pittsburgh. Eastern mills have advanced prices in this market and are now quoting plates at 3.75c. to 4c. for universal and 4.75c. for sheared plates, and structural material at 3c., delivered within the next three to six months. Considerable business is being placed by jobbers with mills able to make rather early deliveries, and fabricating shops are placing stock orders for structural material. Local bar-iron mills have withdrawn from the market because they fear that the coal shortage will interfere with operations. We quote bar iron at 2.50c. to 2.65c., Pittsburgh. The advance in the price of old rails has caused a stiffening up in the price of hard steel bars, which are now quoted at 2.60c. and 2.75c. at mill. The demand for sheets is very heavy and prices continue to advance. There is a shortage in the supply, and consumers are trying to cover by securing such deliveries as mills are able to make. A 5c. price is predicted for black sheets, which have sold as high as 4.30c. out of stock. Some mills are asking higher than warehouse prices. We quote sheets at 3.75c. to 4c., Ohio mill, for No. 28 black, 3.30c. to 3.75c. for No. 10 blue annealed, and 5c. to 5.50c. for No. 28 galvanized. Cleveland warehouse prices have been ad-

vanced \$2 a ton on steel and iron bars and structural material and \$5 a ton on plates, and others items have been advanced. New stock prices are as follows: Steel bars under 2 in., 3.50c.; squares and rounds, 2 in. and over, and flats over 1 in., 4c.; plates, 4.10c.; structural material, 3.60c.; No. 28 black sheets, 3.90c.; No. 10 blue annealed sheets, 3.75c.; hoops, 4.25c., and iron bars, 3.45c.

**Old Material.**—Scrap prices continue to advance, quotations having been marked up on about every grade, including borings and turnings, which have been inactive and weak. The market is very firm at the new prices, and sellers are looking for further advances. The local market is dull, but the demand for shipments to Youngstown and Canton continues active. Local dealers are offering as high as \$19.50 for railroad melting steel. In the Valley heavy melting steel scrap is selling at \$19.50. Iron rails have advanced about \$4 a ton, sales being reported at as high as \$24 per gross ton. Foundry grades, including malleable scrap, are \$1 a ton or more higher. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Steel rails .....	\$19.50 to \$20.00
Old steel rails under 3 ft.....	22.00 to 22.50
Iron rails .....	23.00 to 24.00
Steel car axles .....	40.00 to 42.00
Heavy melting steel scrap.....	18.50 to 19.00
Carwheels .....	15.50 to 16.00
Relaying rails, 50 lb. and over.....	25.00
Agricultural malleable .....	14.50 to 15.00
Railroad malleable .....	17.50 to 18.00
Steel axle turnings .....	12.00 to 12.50
Light bundled sheet scrap.....	12.00 to 12.25

Per Net Ton	
Iron car axles .....	\$36.00 to \$37.00
Cast borings .....	7.00 to 7.25
Iron and steel turnings and drillings.....	6.00 to 6.25
No. 1 busheling .....	14.25 to 14.75
No. 1 railroad wrought .....	18.50 to 19.00
No. 1 cast .....	15.50 to 16.00
Railroad grate bars .....	12.50 to 12.75
Stove plate .....	12.50 to 13.00

## Birmingham

BIRMINGHAM, ALA., Nov. 6, 1916.

**Pig Iron.**—On Nov. 1 a prominent Southern interest sold 1000 tons for Middle Western delivery at \$17.50, announced a minimum of \$18, and withdrew from the market expecting still higher prices. The leading producer and the largest foundry-iron maker followed the example, both advancing to \$18 minimum and both announcing order books as well filled as they cared to have them. Some sales at \$18 were made Friday. Even the conservative are looking for spot iron to reach \$20 within a week. In fact, there have been two sales of export foundry, one of 6000 tons and one of 4000 tons, by Alabama and Tennessee furnaces respectively, at \$20. There never was such a pressure on the Southern iron maker. Inquiries are coming from customers never before heard of in the Southern market. Information is passing through the trade that a lot of iron badly needed shortly has not been bought and those who need it must pay the price. Producers report an improved movement of pig iron in spite of the car shortage—so much so that stocks are diminishing and there is no longer any anxiety in that direction. Stocks in this condition of the market are really desirable. The car situation has been helped by refusals to furnish cars for points where they are apt to be long off the original road. Some Virginia coal orders were not filled for this reason. The Tennessee Company has blown out a stack at Bessemer for relining after 16 months of active operation. The Republic Company's idle stack will go in soon. Steel plants are making new high records. The Gulf States Steel Company produced 20,070 tons of billets in October, 2766 tons of barb wire and 3757 tons of galvanized wire, besides other products. Its blast furnace turned out 10,126 tons. We quote, per gross ton, f.o.b. Birmingham district furnaces, minimum prices as follows:

No. 1 foundry and soft.....	\$18.50
No. 2 foundry and soft.....	18.00
No. 3 foundry.....	17.50
No. 4 foundry.....	17.25
Gray forge .....	17.00
Basic .....	18.50
Charcoal .....	23.00

**Cast-Iron Pipe.**—Makers are in a quandary. Cost of other material has increased so that municipalities



show a disposition to hold off making improvements. Hence, although the pipe makers feel that an increase in price of pipe ought to be made in consonance with the rise in pig iron, they hesitate to do so lest this should further halt prospective customers. However, an advance is imminent. Oil pipe is active. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., \$29; 6-in. and upward, \$26, with \$1 added for gas pipe and 160-ft. lengths.

**Coal and Coke.**—As high as \$5 per ton, f.o.b. mine, for ordinary steam coal was paid by the Du Pont Company for shipment to Hopewell, Va., to which \$4.53 freight must be added. Many mills in the South have closed down days at a time for lack of fuel. Coke is selling up to \$5 per net ton, f.o.b. oven, for standard beehive, and foundry coke has brought as much as \$3.50 to \$4. However, general levels for contract foundry coke are still around \$4.25 to \$4.50. Some spot coke has gone at \$6. Spot markets have no regularity, any price being offered by belated consumers.

**Old Material.**—The advanced prices reported last week rule with strength and bid fair to go higher. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old steel axles .....	\$25.00 to \$30.00
Old steel rails .....	12.50 to 13.00
No. 1 wrought .....	15.00 to 15.50
Heavy melting steel .....	12.00 to 12.50
No. 1 machinery .....	11.50 to 12.00
Carwheels .....	11.50 to 12.00
Tram carwheels .....	11.00 to 11.50
Stove plate and light .....	9.50 to 10.00

## Cincinnati

CINCINNATI, OHIO, Nov. 8, 1916.—(By Wire.)

**Pig Iron.**—The price situation is so complicated that it is difficult to determine what prompt shipment values of either Southern or Northern foundry iron should be. The latter part of last week a large tonnage of Southern iron was sold around \$18, Birmingham basis, but sales at a higher figure were also made for first half delivery. It is rumored that a few melters were able to book their orders at \$18 for delivery in the last half of next year, but the price for that shipment was advanced to \$20 and by one furnace to \$21. A number of Southern furnaces are not willing to open their books yet for business that far ahead. Prompt iron is unobtainable, except in small lots for old customers. The Northern furnaces are sold up on foundry, malleable and basic until July 1, and yard stocks in the Hanging Rock district are too small to be taken into consideration. Among sales reported are 1000 tons of Northern foundry and 500 tons of malleable in central Ohio for the last half of 1917 at \$23, Ironton. Approximately 1600 tons was bought early last week for the same delivery by an Ohio melter at \$22, Ironton, but to-day's quotation by all interests is on a basis of \$24. In southern Ohio a sale was made of 4000 tons of mixed Northern and Southern grades for shipment in the second and third quarters of next year. Numerous sales of Southern foundry iron were made in Indiana for first half shipment, most of them averaging 500 tons each. Some business in that territory was taken for the last half. General reports indicate that last week's total tonnage booked will mark it as one of the best this year. As a consequence, few inquiries are now out. The sharp price advances also undoubtedly tend to keep consumers from coming into the market on the eve of the election. The silvery irons have registered another advance, and \$32 at furnace is now minimum for an 8 per cent analysis. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	\$21.40 to \$23.40
Southern coke, No. 2 f'dry and 2 soft.	20.90 to 22.90
Southern coke, No. 3 foundry.	20.40 to 22.40
Southern coke, No. 4 foundry.	19.90 to 21.90
Southern gray forge	19.40 to 21.40
Ohio silvery, 8 per cent silicon.	31.26 to 32.26
Southern Ohio coke, No. 1.	24.76 to 25.76
Southern Ohio coke, No. 2.	24.26 to 25.26
Southern Ohio coke, No. 3.	23.76 to 24.76
Southern Ohio malleable Bessemer.	24.26 to 25.26
Basic, Northern	24.26 to 25.26
Lake Superior charcoal	23.20 to 24.20
Standard Southern carwheel.	26.40 to 26.90

(By Mail)

**Coke.**—Figures named for nearby shipment are only nominal. As high as \$8 at oven has been done on a

small lot of furnace coke that was loaded on cars. Foundry coke for nearby shipment is quoted all the way from \$7 to \$10, although none has been sold at the last named figure as far as can be ascertained. Contracting is at a standstill on both furnace and foundry coke, and until the situation settles business will probably be confined to coke urgently needed by consumers.

**Finished Material.**—Local warehouses have marked up their prices on practically everything in stock, but they are still behind mill quotations in many instances. The store price on steel bars to-day is 3.45c.; twisted steel bars, 3.60c.; small structural shapes, 3.55c.; cold rolled shafting, 10 per cent plus list; plates, 1/4 in. and heavier, 4.10c.; No. 10 blue annealed sheets, 3.75c.; rounds and hexagons, 2 in. and over, 4c. There is considerable improvement in business, even at the new prices named, as customers who are short are anxious to get under cover before further expected advances are made. The mill price to-day on No. 28 galvanized sheets is 5.40c., f.o.b. Cincinnati or Newport, Ky., and on No. 28 black sheets, 4.15c.

**Old Material.**—Dealers report the market as simply going wild. Advances that will average about \$1 per ton on all grades of scrap have been made and there is a scramble by users to get under cover. Offerings are lighter than they have been for some time, and this connected with the phenomenal prices on pig iron has had considerable to do with stiffening up the scrap market. The following are dealers' prices, f.o.b. at yards, southern Ohio and Cincinnati:

Per Gross Ton	
Bundled sheet scrap .....	\$12.50 to \$13.00
Old iron rails .....	19.75 to 20.25
Relaying rails, 50 lb. and up.	24.25 to 24.75
Re-rolling steel rails .....	20.00 to 20.50
Heavy melting steel scrap .....	17.75 to 18.25
Steel rails for melting .....	17.25 to 17.75
Per Net Ton	
No. 1 railroad wrought .....	\$18.00 to \$18.50
Cast borings .....	5.50 to 6.00
Steel turnings .....	5.50 to 6.00
Railroad cast .....	14.25 to 14.75
No. 1 machinery cast .....	16.00 to 16.50
Burnt scrap .....	10.00 to 10.50
Iron axles .....	30.00 to 30.50
Locomotive tires (smooth inside).	23.75 to 24.25
Pipes and flues .....	11.75 to 12.25
Malleable and steel .....	13.50 to 14.00
Railroad tank and sheet .....	10.75 to 11.25

The C. L. Hils Company, Reedy Street, Cincinnati, expects to move its scrap yard to a site recently secured in West End. The present quarters are too small.

## Buffalo

BUFFALO, N. Y., Nov. 7, 1916.

**Pig Iron.**—Prices continue to mount, with apparently no relief visible in the situation from the consumers' standpoint. Conditions are unprecedented; with all sources of supply contracted ahead for many months and no let up in demand in sight. One of the largest producers of the district announces that it is now entirely out of the market until after Jan. 1, 1918. Another large producer is practically sold up well over next year, and is now quoting \$28, furnace, for immediate acceptance, for any deliveries it has available. Still another furnace, which yet has iron to sell, is holding its last half 1917 product at \$30, with a minimum for first half delivery of \$27 for any grade with a range to \$28 for high-grade foundry, malleable and basic. A large sized tonnage of basic was to-day booked at \$27.50, furnace. Bessemer has sold at \$29, and is now held at from \$29 to \$30. Some yard stock iron owned by one interest is now held at \$30 for spot delivery, and it is thought by most furnacemen that prompt delivery iron available from any furnace will soon reach that figure. We quote as follows, f.o.b., furnace, Buffalo, for last quarter and first half 1917 delivery:

High silicon irons .....	\$27.00 to \$28.00
No. 1 foundry .....	27.00 to 28.00
No. 2 X foundry .....	27.00 to 28.00
No. 2 plain .....	27.00 to 27.50
No. 3 foundry .....	27.00 to 27.50
Gray forge .....	27.00 to 27.50
Malleable .....	27.00 to 28.00
Basic .....	27.00 to 28.00
Bessemer .....	29.00 to 30.00
Charcoal, according to brand and analysis .....	27.00 to 27.50

**Finished Iron and Steel.**—Because of the rapid advance in the price of coke and coal and the absolute certainty of a scarcity in both products various steel companies have tightened up during the week and are more unwilling than ever to entertain additional forward obligations. This was brought about by their inability to know how much material they will be able to get out during the winter and because of the rapidly increasing cost of production. Warehouse prices have been advanced to 3.50c. for bars under 2 in., 3.60c. for structural, 4.10c. for plates and 4.25c. for hoops. Prices of wire products have advanced \$3 per ton during the week, with the expectation on the part of both buyers and sellers that there will be a further advance before the close of the year. For the first time since the outbreak of the war there is an actual scarcity of wire nails. One selling agency reports an offer for wire rods equivalent to \$68 per gross ton, Pittsburgh, but that it was unable to entertain it. The Buffalo Structural Steel Company has taken contract for 400 to 500 tons additional of structural steel for plant No. 3 of the International Graphite Company, Buffalo, and some additional tonnage of structural steel for the Wickwire Steel Company's new plant now under construction. The Eastman Kodak Company, Rochester, has, it is stated, let contract for reinforced concrete factory addition requiring 1000 tons of reinforcing bars to a Cincinnati construction company.

**Old Material.**—The market is very active and buoyant and prices have advanced all along the line. Some large sales have been made at the increased prices. Short orders held by dealers are still a feature of the market, causing such dealers to pay prices above what consumers would pay for like commodities. We quote dealers' asking prices, per gross ton, f.o.b., Buffalo, as follows:

Heavy melting steel .....	\$18.50 to \$19.00
Low phosphorus billet and bloom ends .....	24.00 to 25.00
No. 1 railroad wrought scrap .....	21.00 to 21.50
No. 1 railroad and machinery cast scrap .....	18.50 to 19.00
Steel axles .....	34.00
Iron axles .....	34.00
Car wheels .....	17.00 to 17.50
Railroad malleable .....	17.50 to 18.00
Machine shop turnings .....	7.50 to 8.00
Heavy axle turnings .....	13.50 to 14.00
Clean cast borings .....	9.00 to 9.50
Iron rails .....	20.50 to 21.00
Locomotive grate bars .....	13.50 to 14.00
Stove plate (net ton) .....	12.00 to 12.50
Wrought pipe .....	14.25 to 14.75
No. 1 busheling .....	16.00 to 16.50
No. 2 busheling .....	12.00 to 12.50
Bundled sheet scrap .....	13.00 to 13.50
Bundled tin scrap .....	15.00 to 15.50

## St. Louis

ST. LOUIS, Mo., Nov. 6, 1916.

**Pig Iron.**—The excited condition of the pig-iron market continued all through the week, with a rather wide spread of quotations as between the different furnaces. Opening Monday at \$17, Birmingham, for No. 2 Southern foundry, the prices showed continuous advances, with sales made Saturday and to-day as high as \$20 per ton, Birmingham. Transactions in Northern basic showed a similar condition as to price quotations, and sales were made at \$24, Chicago, with the prices held to-day at \$25, Chicago. A considerable number of sales of Bessemer ferrosilicon, 13 per cent, were made at \$35 per ton, Ohio furnaces, with higher prices impending and \$45 asked for 15 per cent silicon. On 4 to 5 per cent silicon a wide spread was noted as between different furnaces, ranging from \$21 to \$25 per ton. The excited character of the market was further exemplified by the readiness with which transactions were closed. The inquiry for 10,000 tons of basic was closed, being divided among several furnaces, no one furnace being in position to take the entire amount. There was very heavy buying in all grades and deliveries of foundry iron, the purchases coming from the stove-molding interests, car-wheel concerns, malleable foundries and all other branches of the trade. The aggregate, outside of the basic transaction referred to, is estimated at 25,000 tons for the week. The status of the market at this writing is shown by a variance in quotations for No. 2 Southern foundry, Birmingham basis, there being a range between \$19 and \$21, Bir-

mingham. Foundries have purchased first half delivery iron with a view to carrying it over in their own yards when they found that furnaces would make no contracts for last half delivery at the prices prevailing. It is understood that the basic contract for 10,000 tons was done at \$24 per ton, Chicago.

**Coke.**—The coke market, so far as quotations are concerned, remained in the same nervous condition as the week previous, but no transactions of consequence were closed. By-product coke, being considerably sold ahead so far as the local output is concerned, showed no particular feature during the week.

**Finished Iron and Steel.**—The leading interests are avoiding the acceptance of orders because of the extremely deferred deliveries now existing. In steel rails nibbles on standard sections are appearing for 1918 delivery; no specific inquiries for specified tonnages have been made. In track fastenings spikes are not so strong as bolts and angle bars. The warehouse interests advanced their prices, but movement out of warehouse stock continued active at these quotations: Soft steel bars, 3.40c.; iron bars, 3.35c.; structural material, 3.40c.; tank plate, 4.05c.; No. 10 blue annealed sheets, 3.70c.; No. 28 black sheets, cold-rolled, one-pass, 4.35c.; No. 28 galvanized sheets, black sheet gage, 5.60c.

**Old Material.**—The scrap market was very strong all week, with advancing prices as a result of increasing demand from the rolling mills, steel mills and foundries. Further accentuating the situation was the apparent short interest of some of the dealers. The light lists coming out from the railroads are also having a decided effect upon the situation, and two systems, the Missouri-Pacific-Iron Mountain and the Frisco, are putting out no lists at all, handling their scrap materials by special negotiations. Lists out included the following: Wabash, 1700 tons; Vandalia, 600 tons; Kansas City Southern, 350 tons; Union Pacific, 2000 tons. Relaying rails, continuously more difficult to get, are advancing with the accentuated scarcity. Altogether, the market is in an excited state, with transactions based largely upon the position of the buyer and seller at the moment of making the deal. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails .....	\$21.00 to \$21.50
Old steel rails, rerolling .....	22.00 to 22.50
Old steel rails, less than 3 ft. ....	21.50 to 22.00
Relaying rails, standard section, subject to inspection .....	25.00 to 27.00
Old carwheels .....	15.50 to 16.00
No. 1 railroad heavy melting steel scrap .....	20.00 to 20.50
Heavy shoveling steel .....	15.50 to 16.00
Frogs, switches and guards cut apart .....	20.00 to 20.50
Bundled sheet scrap .....	9.50 to 10.00

Per Net Ton	
Iron angle bars .....	\$20.00 to \$21.00
Steel angle bars .....	18.00 to 18.50
Iron car axles .....	31.50 to 32.00
Steel car axles .....	34.00 to 34.50
Wrought arch bars and transoms .....	24.50 to 25.00
No. 1 railroad wrought .....	19.00 to 19.50
No. 2 railroad wrought .....	18.00 to 18.50
Railroad springs .....	18.00 to 18.50
Steel couplers and knuckles .....	21.00 to 21.50
Locomotive tires, 42 in. and over, smooth inside .....	24.00 to 24.50
No. 1 dealers' forge .....	17.00 to 17.50
Cast-iron borings .....	8.50 to 9.00
No. 1 busheling .....	16.00 to 16.50
No. 1 boilers, cut to sheets and rings .....	13.00 to 13.50
No. 1 railroad cast scrap .....	13.00 to 13.50
Stove plate and light cast scrap .....	9.50 to 10.00
Railroad malleable .....	13.00 to 13.50
Agricultural malleable .....	11.00 to 11.50
Pipes and flues .....	14.00 to 14.50
Heavy railroad sheet and tank scrap .....	13.50 to 14.00
Railroad grate bars .....	11.00 to 11.50
Machine shop turnings .....	8.50 to 9.00

## San Francisco

SAN FRANCISCO, CAL., Oct. 30, 1916.

New business is appearing rather slowly, though a few important inquiries are coming up, especially for plates and heavy sheets. Export demand continues to be an important item. Shipments on old contracts to manufacturers are large, and merchants also are specifying freely, though stocks in most lines are large and the tonnage going out in a jobbing way is hardly normal. Lumber interests are buying more than for some time. Manufacturing plants in nearly all lines are well



occupied, and shipbuilding capacity has not yet reached its maximum.

**Bars.**—Jobbing trade in merchant bars is quiet, but this apparently is much more than compensated for by the movement from mills to manufacturers. A fair amount of reinforcing steel has recently been placed for several large buildings, but requirements in this line are below expectations. Some Oriental business is coming through, but local mills at present have no great quantity available for export. The latter quote about 3c. on contracts for more or less distant delivery, while the latest figure on Eastern bars is around 2.75c., Pittsburgh. The jobbing figure remains at 4c.

**Structural Material.**—Inquiries for fabricated material continue few and usually small, and local shops are still somewhat hampered by the labor situation. Shipbuilders are constantly in the market, and most of them have placed contracts covering work for much of the coming year. Plans have been completed for a theater building in Berkeley. The California Steel Company has a small contract for the Carnegie Library at Sacramento, and plans are being drawn for a six-story building at Fresno, Cal.

**Plates.**—Foreign inquiries are still in the market, with mills showing no alacrity in bidding for them. The local ship situation shows no change. Tank and pipe manufacturers continue quite busy, and new inquiries amounting to about 1500 tons have just been received from southern California. Bids have also been taken for riveted pressure pipe for the Cherry River power development of the Hetch Hetchy project. It is rumored that the Union Oil Company is planning a new refinery at San Pedro. Mill quotations show great variation, narrow sizes being offered as low as 3.75s., or even 3.50c., Pittsburgh, while wide plates are firm at 4.25c.

**Sheets.**—Corrugated sheets have picked up a little, a few large orders having caused a perceptible reduction of stocks. Flat galvanized sheets also are in fair demand, though the jobbing price has been raised to 6.37c. for No. 28. Jobbing trade in blue annealed is limited, but inquiries are coming out well for special purposes and some attractive specifications for both blue annealed and black sheets for export have recently appeared.

**Wrought Pipe.**—Business in small sizes continues to drag, which is attributed to lack of building activity. Oil-field requirements are large, but have mostly been covered for the present, and oil operators are not disposed to undertake large line construction at present.

**Cast-Iron Pipe.**—Porterville, Cal., will take bids Nov. 6 for 30 tons of 4-in. and Los Angeles received bids Oct. 27 for about 235 tons of 8 and 12 in. Hermosa Beach is also in the market for a lot of 8 and 10 in. flexible-joint pipe. Corporation buying is about at a minimum, as requirements were anticipated before the recent advance. Prices continue at \$37 per net ton for 6-in. and over, \$40 for 4-in., and \$1 extra for class A and gas pipe.

**Pig Iron.**—A fair tonnage of Southern foundry iron has recently been placed for railroad shops in this district, but most foundries are amply stocked from old purchases and are not yet willing to discuss next year's requirements, the impression among local buyers being that prices will be lower. Furnace agents, however, maintain a firm attitude, quoting \$27 per gross ton for No. 1 Southern foundry.

**Coke.**—Business is quiet, with most foundries well supplied, but a few carloads have recently been placed. Southern foundry coke is offered here at about \$15.25 per net ton.

**Old Material.**—The local scrap situation shows little change. While consuming requirements are much larger than in former years, with further increases in sight, dealers have been unable to get prices above the recent quotations on steel scrap of \$10 to \$13 per gross ton. Buyers at distant points are not operating in this market and supplies so far have been ample. Cast-iron scrap is rather firm, with a good demand, being quoted at about \$16 per net ton.

**Ferroalloys.**—Ferrosilicon is in active demand, and

local stocks are moving rapidly. Ferromanganese also is moving well, and is quoted at \$175 to \$180 in carloads, San Francisco, for December delivery.

## New York

NEW YORK, Nov. 8, 1916.

**Pig Iron.**—A large volume of inquiry is still before the market, 2000-ton contracts being under consideration in many cases. A Connecticut malleable interest has asked for that amount for this year's delivery and from Poughkeepsie, Elizabethport and Jersey City are separate inquiries for 2000 tons, two of these being for delivery in the first half of next year and the third for the second half. The Virginia interest which last week withdrew from the market, having sold at \$19.50 for No. 2 X at furnace, is now quoting \$24 at furnace. This quotation is also made on No. 2 X by various eastern Pennsylvania furnaces, though \$23 was done by such furnaces in the past week. In the Buffalo district furnaces which last week were quoting \$25 for No. 2 X have realized higher prices on sales early in this week one interest having sold some iron at \$26.50 while another has sold at \$27.50 at furnace, delivery in the first half. Relatively a small portion of the business done in the past week has been with New England. The Southern iron situation shows a variety of prices. Warrants sold up to \$18.50 by Nov. 3. Inquiry for warrant iron is more active at rising prices and comes from all sections of the country. Foundries are carrying fair stocks of iron and most first quarter deliveries will come to yards already quite well supplied. There are cases, however, where deliveries are being anticipated at the request of buyers and some iron sold for the last two months of this year and the first two months of next year is already in the buyers' hands. Virginia iron sold at \$22 up to Nov. 3, including several lots of 1000 and 2000 tons. The total sales by Virginia furnaces in the past two weeks are put at 175,000 tons. Business seems to be swinging toward eastern Pennsylvania furnaces, as some quotations from that district have been rather more advantageous than from Buffalo and Virginia. We quote at tidewater for early delivery: No. 1 foundry, \$25 to \$25.50; No. 2 X, \$24 to \$25; No. 2 plain, \$23.50 to \$24; Southern iron at tidewater, \$24 to \$24.50 for No. 1 and \$23.50 to \$24 for No. 2 foundry and No. 2 soft.

**Ferroalloys.**—An unconfirmed report states that a domestic producer of ferromanganese has very recently contracted to furnish an American consumer with a large amount of the alloy, delivery to be made in 1917 at a price below the lowest recently mentioned or under \$160, delivered. Another contract reported with a domestic producer is for about 100 tons a month for delivery in the first half of 1917. One foreign inquiry calls for 2500 tons. In general, inquiries and sales are few, with the British quotation standing at \$164, sea-board, and the domestic at \$160 to \$165, delivered. Inquiries from Canada amount to several thousand tons for delivery in the early part of 1917, one large Canadian steel company alone asking for a substantial amount. Specifications on contract are urgent, while receipts from England are reported satisfactory. Spiegeleisen is quiet at \$40 to \$45, furnace. Ferrosilicon, 50 per cent, is scarce even for delivery on contract. Contracting for 1917 delivery is not very general as yet but the basis still spoken of is around \$100, Pittsburgh.

**Structural Material.**—No notably large fabricated steel contracts are noted since last week's report, but quite a number of new steel building projects have been offered. The main jobs closed include 1200 tons for the Central of Jersey stationed at Newark; 600 tons for a factory at Paulsboro, N. J., and 1000 tons for hangars for the United States Government, the last placed through a general contractor. The work recently offered and still pending covers in part 1000 tons for the Watervliet Arsenal; 1000 tons for the National Electric Lamp Works of the General Electric Company at Providence; 650 tons for a Sheffield Farms Slawson-Decker Creamery, Brooklyn; 800 tons for the Broad Street subway under the City Hall, Philadelphia; 650 tons for a rolling mill building of the Cleveland Brass



Copper Company; 400 tons for the Y. W. C. A. at Hartford; 800 tons for the Crucible Steel Company of America at Harrison, N. J.; 450 tons for extension of the United Engineering Society's Building, Thirty-ninth Street; 400 tons for Benning Road viaduct, Washington, D. C., and 350 tons for the State Normal Training School at Potsdam, N. Y. Some 3400 tons for the Maine Central, 2500 tons for the Pennsylvania and about 400 tons for the Southern Railroad are still pending. We quote plain material from 2.869c. to 3.169c., depending more on the delivery. Warehouse prices are \$3 per ton higher, or 3.5c. New York, minimum.

**Steel Plates.**—Buying of the last few weeks of railroad cars may be responsible in a large way for the apparent stiffening in universal plates, as only one sale below 3.50c., Pittsburgh, has been noted, and this a large one at 3.40c. The past week, like its predecessors, has been notable in the large tonnage of foreign inquiries. The extent to which both seller and buyers will go is indicated in the sale for shipment in several days of a single plate for marine boiler use at 15c. per lb. No surprise is shown at a quotation of 10c. for as large a lot as 1000 tons for ship boilers, because this is an indication that the business is really not wanted. The status of the car buying is indicated briefly elsewhere. We quote universal plates at 3.569c. to 4.169c., New York, with 3.669c. minimum for earliest shipment, and sheared plates up to 84 in. and in about three months at 4.169c., New York, and the widest plates at 4.419c. to 4.669c. for what may be obtained in the first half of 1917. Plates from warehouse range from 4c. to 4.50c., New York for what is available.

**Iron and Steel Bars.**—No great amount of business is going at the higher future delivery prices recently established, but this is largely because consumers are covered for the first quarter at lower levels for as much as the mills are willing to put on the books. Anything approaching speculative buying is not possible, as mills are resisting any contracting far forward. Warehouse prices have advanced \$3 per ton in the case of both iron and steel bars, but no advance has yet been made in the mill shipments of bar iron. We quote steel bars at 2.869c. to 3.019c., New York, the higher price for the earlier shipments. We quote mill shipments of iron bars at 2.669c., New York. From warehouse steel bars are 3.50c., New York, and iron bars, 3.40c.

**Old Material.**—The situation is much stronger on account of Western developments, but business with eastern Pennsylvania consumers is still checked by embargoes at important consuming points. Brokers quote buying prices about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (for eastern Pennsylvania shipment) .....	\$13.00 to \$13.25
Old steel rails (short lengths) or equivalent .....	16.50 to 17.00
Relaying rails .....	28.50 to 29.00
Revolving rails .....	21.00 to 21.50
Revolving rails (for export) .....	22.50 to 23.00
Iron car axles (for export) .....	39.50 to 40.00
Steel car axles (for export) .....	41.00 to 41.50
No. 1 railroad wrought .....	21.25 to 21.75
Wrought-iron track scrap .....	18.50 to 18.75
No. 1 yard wrought, long .....	16.00 to 16.25
Light iron (nominal) .....	3.50 to 4.00
Cast borings (clean) .....	8.25 to 8.50
Machine shop turnings (nominal) .....	7.00 to 7.25
Mixed borings and turnings (nominal) .....	7.00 to 7.25
Wrought pipe .....	14.25 to 14.50

Foundries are exhibiting a little more interest in scrap because of the rapid advances in the price of pig iron. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery) .....	\$17.50 to \$18.00
No. 2 cast (heavy) .....	15.50 to 16.00
Stove plate .....	12.50 to 13.00
Locomotive grate bars .....	12.00 to 12.50
Old carwheels (nominal) .....	17.00 to 17.50
Malleable cast (railroad) .....	15.00 to 15.50

**Cast-Iron Pipe.**—The situation presents no new features, public lettings being few and small, but private buying proceeds vigorously, with good orders being placed for spring delivery. The rapid advances in pig iron are making consumers of pipe more desirous of getting in orders for their next year's requirements.

Prices of pipe are strong and an advance of \$3 to \$4 per ton may be expected any day. Meanwhile, carload lots of 6 in., class B and heavier, are held at \$32.50 per net ton, with \$1 per ton extra for class A and gas pipe.

## British Steel Market

### More Blast Furnaces Starting—American Semi-Finished Steel Quiet

(By Cable)

LONDON, ENGLAND, Nov. 8, 1916.

Pig iron is in fair demand for November and December delivery, but export business remains restricted. Additional furnaces are starting and good contracts for hematite iron have been booked for Italy. Tin plates are steadier at 33s. American semi-finished steel is neglected. Italy has bought ferromanganese for January-March delivery at £34 f.o.b.

Benzol is quoted at 13d., toluol at 2s. 3d. and ammonia sulphate at 17s. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 33s.	
Steel black sheets, No. 28, export, f.o.b. Liverpool, £20.	
Steel ship plates, Scotch, delivered local yards, £13 17s. 6d.	
Steel rails, export, f.o.b. works, £10 17s. 6d.	
Hematite pig iron, f.o.b. Tees, 142s. 6d., compared with about 140s. a week ago.	
Sheet bars (Welsh) delivered at works in Swans Valley, £15 5s. nominal.	
Steel bars, export, f.o.b. Clyde, £18.	
Ferromanganese (nominal), £33.	
Ferrosilicon, 50 per cent, c.i.f., £27.	

### Manganese-Ore Imports

Manganese-ore imports to the United States in August this year were 76,721 gross tons, against 81,942 tons in July. The August receipts are next to the largest this year, those of May being third at 74,825 tons. The total of imports for the eight months to Sept. 1, 1916, was 395,686 tons, compared with 145,003 tons to Sept. 1, 1915, and 183,029 tons to Sept. 1, 1914. The average monthly rate thus far this year is 49,460 tons, against 28,757 tons in 1913, the previous record, and 22,470 tons as the average for the five-year period 1910-1914. Manganese ore imports to the United States are now considerably in excess of those to Great Britain, which for the first nine months of this year were 348,394 tons.

### Proposed Japanese Steel Plant

A prospectus has been issued by the promoters of the Oriental Iron Smelting Company of Japan, which is to work the Taichun iron mine, Anhui, China, by taking over the concession obtained by the Chino-Japanese Industrial Development Company from the Pekin Government, referred to in THE IRON AGE, Aug. 3, 1916. The company will have a capital of \$12,462,500 with which to complete one plant for producing 170,000 tons of pig iron per year and another to produce 150,000 tons of steel per year.

It is expected that at the coming session of the Wisconsin Legislature, in January, a bill will be introduced with the aim of placing a tax of 10c. per ton on all iron ore mined in Wisconsin and a tax of 2c. per ton on iron ore shipped through Wisconsin, as from docks at Superior and Ashland. The proposed tax, on the basis of present output and shipments, would mean a revenue of \$600,000 annually.

The Koren Mfg. Company, Cleveland, will make several additions to its products, including cutting edge tools used largely for farm purposes and pressed steel wrenches. The company, in addition to its factory on East Fifty-fifth Street, has taken a location on Front Street, to be used mainly for heat-treating purposes.

## Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c. Denver, pipe, 76.1c., minimum carload, 46,000 lb.; structural steel and steel bars, 83.6c., minimum carload, 36,000 lb. Pacific coast (by rail only), pipe, 65c.; structural steel and steel bars, 75c., minimum carload, 50,000 lb.; structural steel and steel bars, 80c., minimum carload, 40,000 lb. No freight rates are being published via the Panama Canal, as the boats are being used in transatlantic trade.

**Structural Material.**—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, 1/4 in. thick and over, and zees 3 in. and over, 2.75c. to 2.85c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs.	.10
Angles, 3 in. on one or both legs less than 1/4 in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.	.20 to .80
Deck beams and bulb angles.	.30
Handrail tees.	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting to lengths 3 ft. and over.	

**Plates.**—Tank plates, 1/4 in. thick, 6 in. up to 100 in. wide, 3.50c. to 4c. base, net cash, 30 days, or 1/2 of 1 per cent discount in 10 days, carload lots. Extras are:

	Cents per lb.
Tank steel	Base
Pressing steel (not flange steel for boilers).	.10
Boiler and flange steel plates.	.15
"A. B. M. A." and ordinary firebox steel plates.	.20
Still bottom steel.	.30
Locomotive firebox steel.	.50
Marine steel, special extras and prices on application.	

### Gage Extras

Rectangular, 1/4 in. thick, over 6 in. wide to 100 in. wide. Base	
Lighter than 1/4 in., to 3/16 in., up to 72 in. wide.	.10
*Lighter than 1/4 in., including 3/16 in., over 72 in. to 84 in.	.20
*Lighter than 1/4 in., including 3/16 in., over 84 in. to 96 in.	.30
*Lighter than 1/4 in., including 3/16 in., over 96 in. to 100 in.	.40
*Lighter than 1/4 in., including 3/16 in., over 100 in. to 102 in.	.45
Lighter than 3/16 in., including No. 8, up to 72 in. wide.	.15
*Lighter than 3/16 in., including No. 8, over 72 in. to 84 in.	.25
*Lighter than 3/16 in., including No. 8, over 84 in. to 96 in.	.35
Lighter than No. 8, including No. 10, up to 60 in. wide.	.30
Lighter than No. 8, including No. 10, over 60 in. to 64 in.	.35
Up to 72 in. and not less than 10.2 lb. per sq. ft. will be considered 1/4 in.	
Over 72 in. must be ordered 1/4 in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.	
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of 3/16 in., take price of 3/16 in.	
Over 72 in., ordered weight 3/16 in., take No. 8 price.	
Over 72 in., ordered weight No. 8, take No. 10 price.	

### Width Extras

Over 100 in. to 110 in. inclusive.	.05
Over 110 in. to 115 in. inclusive.	.10
Over 115 in. to 120 in. inclusive.	.15
Over 120 in. to 125 in. inclusive.	.25
Over 125 in. to 130 in. inclusive.	.50
Over 130 in.	1.00

### Length Extras

Universal plates 80 ft. long up to 90 ft. long.	.05
Universal plates 90 ft. long up to 100 ft. long.	.10
Universal plates 100 ft. long up to 110 ft. long.	.20

### Cutting Extras

No charge for rectangular plates to lengths 3 ft. and over.	
Lengths under 3 ft. to 2 ft. inclusive.	.25
Lengths under 2 ft. to 1 ft. inclusive.	.50
Lengths under 1 ft.	1.55
Circles 3 ft. in diameter to 100 in.	.30
Circles over 100 to 110 in. (width extra).	.35
Circles over 110 to 115 in. (width extra).	.40
Circles over 115 to 120 in. (width extra).	.45
Circles over 120 to 125 in. (width extra).	.55
Circles over 125 to 130 in. (width extra).	.80
Circles over 130 in. (width extra).	1.30
Circles under 3 ft., to 2 ft. inclusive.	1.55
Circles under 2 ft., to 1 ft. inclusive.	.80
Circles under 1 ft.	1.85
Half circles take circle extras.	
Sketches not over four straight cuts, inc. straight taper.	.10
Sketches having more than four straight cuts.	.20
Plates sheared to a radius take complete circle extras.	

\*Including extra for width.

**Wire Rods.**—Including chain rods, \$60 to \$65.

**Wire Products.**—Prices to jobbers effective Oct. 19: Fence wire Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, \$2.80; galvanized, \$3.50. Galvanized barb wire and sta-

ples, \$3.70; painted, \$3. Wire nails, \$2.85. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Cement-coated nails, \$2.75. Woven wire fencing, 55 per cent off list for carloads, 54 off for 1000-rod lots, 53 off for less than 1000-rod lots.

**Wrought Pipe.**—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect on butt-weld pipe from Sept. 7, 1916, and on lap-weld pipe from Nov. 1, 1916, all full weight:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
1/4, 1/2 and 3/4	62	35 1/2	1/4 and 1/2	51	24
1/2	66	51 1/2	3/4	52	25
3/4 to 2	69	55 1/2	1/2	53	26
			3/4 to 1 1/2	59	43
Butt Weld			Lap Weld		
2	62	49 1/2	1 1/4	45	36
2 1/2 to 6	65	52 1/2	1 1/2	51	37
7 to 12	62	48 1/2	2	52	38
13 and 14	52 1/2	..	2 1/2 to 4	54	41
15	50	..	4 1/2 to 6	54	41
			7 to 12	53	40
Reamed and Drifted			Butt Weld, extra strong, plain ends		
1 to 3, butt.	67	53 1/2	1/4 to 1 1/2, butt.	54	37
2, lap.	60	47 1/2	1 1/4, lap	49	34
2 1/2 to 6, lap.	63	50 1/2	1 1/2, lap	46	31
			2, lap	47	32
			2 1/2 to 4, lap.	50	35
Lap Weld, extra strong, plain ends			Butt Weld, extra strong, plain ends		
1/4, 1/2 and 3/4	58	40 1/2	1/4, 1/2 and 3/4	51	34
1/2	63	50 1/2	1/2	56	42
3/4 to 1 1/2	67	54 1/2	3/4 to 1 1/2	60	45
2 to 3	68	55 1/2			
Lap Weld, extra strong, plain ends			Butt Weld, extra strong, plain ends		
2	60	48 1/2	1 1/4	47	32
2 1/2 to 4	63	51 1/2	1 1/2	52	38
4 1/2 to 6	62	50 1/2	2	54	41
7 to 8	58	44 1/2	2 1/2 to 4	56	44
9 to 12	53	39 1/2	4 1/2 to 6	55	43
			7 to 8	49	37
			9 to 12	44	32

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

**Boiler Tubes.**—Discounts on less than carloads, freight to destination added, effective from Nov. 1, 1916, are as follows:

Lap-Welded Steel	Standard Charcoal Iron
1 1/2 in.	31
1 3/4 and 2 in.	43
2 1/4 in.	40
2 1/2 and 2 3/4 in.	46
3 and 3 1/4 in.	51
3 1/2 to 4 1/2 in.	52
5 and 6 in.	45
7 to 13 in.	42
1 1/2 in.	31
1 3/4 and 2 in.	43
2 1/4 in.	40
2 1/2 and 2 3/4 in.	46
3 and 3 1/4 in.	51
3 1/2 to 4 1/2 in.	52
5 and 6 in.	45
7 to 13 in.	42

Locomotive and steamship special charcoal grades bring higher prices.

1 1/4 in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

**Sheets.**—Makers' prices for mill shipments on sheets of U. S. standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

### Blue Annealed Sheets

Nos. 3 to 8	3.50 to 3.60
Nos. 9 to 12	3.15 to 3.25
Nos. 13 and 14	3.25 to 3.35
Nos. 15 and 16	3.30 to 3.40

### Box Annealed Sheets, Cold Rolled

Nos. 17 to 21	3.30 to 3.45
Nos. 22 and 24	3.35 to 3.50
Nos. 25 and 26	3.40 to 3.55
No. 27	3.45 to 3.60
No. 28	3.50 to 3.65
No. 29	3.55 to 3.70
No. 30	3.65 to 3.80

### Galvanized Sheets of Black Sheet Gage

Nos. 10 and 11	4.00 to 4.10
Nos. 12 to 14	4.10 to 4.20
Nos. 15 and 16	4.25 to 4.35
Nos. 17 to 21	4.40 to 4.50
Nos. 22 and 24	4.55 to 4.65
Nos. 25 and 26	4.70 to 4.80
No. 27	4.85 to 4.95
No. 28	5.00 to 5.10
No. 29	5.15 to 5.25
No. 30	5.30 to 5.40

### Tin Mill Black Plate

Nos. 15 and 16	3.20 to 3.30
Nos. 17 to 21	3.25 to 3.35
Nos. 22 to 24	3.30 to 3.40
Nos. 25 to 27	3.35 to 3.45
No. 28	3.40 to 3.50
No. 29	3.45 to 3.55
No. 30	3.45 to 3.55
Nos. 30 1/2 and 31	3.50 to 3.60



## Metal Markets

### The Week's Prices

Cents Per Pound for Early Delivery							
Copper, New York		Tin,	Lead		Spelter		
Lake	Electro-	New	New	St.	New	St.	
Nov.	lytic	York	York	Louis	York	Louis	
1.....	29.60	28.62½	41.70	7.00	6.87½	10.62½	10.37½
2.....	29.00	28.75	41.70	7.00	6.87½	10.62½	10.37½
3.....	29.00	28.87½	42.25	7.00	6.87½	10.75	10.50
4.....	29.25	29.00	.....	7.00	6.87½	10.75	10.50
5.....	29.50	29.50	42.25	7.00	6.87½	10.75	10.50

NEW YORK, Nov. 8, 1916.

Copper is higher and the market is sensitive because of the great scarcity of nearby metal. Tin is stronger despite having been dull. Lead has continued quiet at unchanged quotations. Spelter was active and quotations advanced last week, but the market now shows a quieter tendency. Antimony is quiet, but the large interests have faith in the future and are not sacrificing their metal.

#### New York

Copper.—A realization of the scarcity of copper for delivery up to the end of January has created a nervous and sensitive market. Quotations are not only higher, but show a wider spread than usually exists. Actual prices are largely a matter of negotiations. Conservative members of the trade put electrolytic at 29.50c. for November, 29c. for December, 26.50c. for January, 28.25c. for February, and 28c. for March. At the same time a sale of spot electrolytic is reported at 31c., and others for all of next year at 26.75c. This month probably 75,000,000 lb. has been placed, and it is believed that business would be of even greater volume were it not for the scarcity of nearby positions. Prime Lake is nominally held at 29.50c. A heavy business in arsenical Lake has been done at 28c. for March delivery. The London market was excited on Monday, advancing £1 10s. to £144. The exports this month, including yesterday, total 3044 tons. Imports in nine months of this year totaled 156,000 tons, against 137,500 tons in the entire year 1915. Stocks in Great Britain and France Oct. 31 amounted to 5458 tons against 5796 tons Sept. 30. The total European supply, including metal afloat from Chile and Australia, Oct. 31, amounted to 10,108 tons, against 10,371 tons a month previous.

Tin.—The market has been continuously dull, but it is nevertheless strong, the quotation for spot Straits Monday being 42.5c., with spot Banca at 41.75c. Banca is again offered for shipment from Batavia. On Nov. 3 the market was keenly interested in a report that a steamer with 360 tons, en route from Singapore to London, had been sunk by a submarine in the Mediterranean. The news had but little effect here, but the London market advanced £1 15s. Ordinarily such news would send the market up with a rush. The arrivals this month amount to 205 tons, and there is afloat 4377 tons.

Lead.—Dull, but comparatively firm, the market continues unchanged, except that independent producers show a tendency to shade at certain Eastern points. The leading interest has made no change in its quotations, asking 7c., New York, and 6.92½c., St. Louis. At the latter point other producers ask 6.98½c. The exports of this month, including yesterday, total 678 tons. The London quotation for spot, as compared with that of a week ago, is unchanged at £30 10s.

Spelter.—The demand from all directions was active last week and quotations advanced to 10.75c., New York, and 10.50c., St. Louis, for prompt. December is held at 10.37½c. to 10.50c., St. Louis, and first quarter at 10.25c., St. Louis. Dealers continue to show a disposition to buy, but the producers are seemingly not anxious to sell, continuing to adhere to their belief that a higher market is to be expected. On Monday a quieter tendency was evident, but it was largely due to the attitude of the producers. The exports this month, including yesterday, total 2861 tons. The Lon-

don quotation for spot is higher at £53 5s. against £52 15s. a week previous.

Antimony.—Late last week a fair business was done in future shipments from the Orient, but on the whole the market has been quiet. The quotation for spot, duty paid, is 12.75c. to 13.25c. Some of the larger interests are unwilling to sell because of their faith in a stronger market next year.

Aluminum.—No. 1 virgin aluminum, 98 to 99 per cent pure, is slightly easier at 63c. to 65c. per lb.

Old Metals.—The market is firm. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible.....	27.00 to 27.50
Copper, heavy and wire.....	25.50 to 26.00
Copper, light and bottoms.....	22.50 to 23.00
Brass, heavy.....	15.50 to 15.75
Brass, light.....	12.25 to 12.75
Heavy machine composition.....	21.00 to 21.50
No. 1 yellow rod brass turnings.....	15.25 to 15.75
No. 1 red brass or composition turnings.....	16.00 to 17.00
Lead, heavy.....	6.625
Lead, tea.....	6.125
Zinc.....	8.00 to 8.25

#### Chicago

Nov. 6.—A more active market and higher prices developed in copper last week, orders for the first half of next year being freely placed. A stronger tin market also obtains. Lead has been dull but for spelter higher prices rule. We quote: Casting copper, 28c. to 28.50c.; Lake copper, 29c. to 29.50c.; tin, carloads, 43c., and small lots, 45c.; lead, 6.95c.; spelter, 10.65c.; sheet zinc, 15c.; Cookson's antimony, 50c.; other grades, 14.50c. to 15c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 24.50c.; copper bottoms, 21.50c.; copper clips, 23.50c.; red brass, 19.50c.; yellow brass, 15.25c.; lead pipe, 6c.; zinc, 7¼c.; pewter, No. 1, 25c.; tinfoil, 30c.; block tin pipe, 35c.

#### St. Louis

Nov. 6.—In the non-ferrous metal market prices generally are firm, with quotations as follows: Lead, 6.92½c. to 7c. in carload lots, and spelter 10c. to 10.25c., according to delivery, in carloads. In less than carload lots quotations are: Lead, 7.25c.; spelter, 11.50c.; tin, 44.50c.; Lake copper, 29c.; electrolytic copper, 28.50c.; antimony, 16c. In the Joplin district zinc ore prices were stronger by \$5, the top basis price for zinc blende being \$80, and the average for the week for the district \$77. Calamine was also stronger with the best price \$47.50, and the average for the week \$43. Lead ore sold up to \$87, and but little was sold lower than \$85. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 9c.; heavy yellow brass, 12c.; heavy red brass and light copper, 17c.; heavy copper and copper wire, 19c.; zinc, 6c.; lead, 5c.; tea lead, 3.50c.; pewter, 25c.; tinfoil, 31c.

#### Ferrosilicon Imports Larger

Imports of high-grade ferrosilicon are larger now than in 1915, as the following table, compiled from Government data, shows. The figures represent the monthly average in gross tons:

To Sept. 1, 1916 (8 months).....	552
To Sept. 1, 1915 (8 months).....	454
Calendar year 1915.....	435
Calendar year 1914.....	512

The largest imports this year were 754 tons in April and the smallest, 417 tons in May. The July and August amounts were 487 tons and 479 tons respectively.

The consumption of 50 per cent ferrosilicon in the United States is now put at 30,000 to 35,000 tons per year.

To those particularly concerned with employment problems, Bulletin 202 of the U. S. Bureau of Labor Statistics, just issued, will appeal. It contains the proceedings of the May conference of the Employment Managers' Association of Boston, attended by representatives of nine States, including the New England States, which comprise the territory of the Boston association.



## Iron and Industrial Stocks

NEW YORK, Nov. 8, 1916.

After a few days of great strength, taking steel common and a few other stocks to new high records, the approach of the Presidential election appeared to cast its shadow on the market, causing some selling of securities and a more cautious attitude among investors, but on Monday of this week another burst of activity carried prices still higher. The range of prices on active iron and industrial stocks from Wednesday of last week to Monday of this week (Tuesday being a holiday) was as follows:

Allis-Chal., com.. 25 1/2- 28 3/4	Gt. No. Ore Cert. 42 3/4- 45
Allis-Chal., pref.. 82 - 85 1/4	Int. Harv. of N. J., com. .... 116 3/4-118
Am. Can., com... 61 3/4- 64 3/4	La Belle Iron, com. .... 78 - 79
Am. Can., pref... 113 - 114	La Belle Iron, pref. .... 134
Am. Car & Fdy., com. .... 67 1/2- 71 3/4	Lacka. Steel.... 88 1/4- 92 1/2
Am. Car & Fdy., pref. .... 117 1/2-118 1/2	Lake Sup. Corp.. 19 3/4- 33 1/2
Am. Loco., com.. 82 1/4- 94	Midvale Steel.... 68 - 70 1/4
Am. Loco., pref.. 106 3/4-108 1/2	Nat. En. & Stm., com. .... 27 1/2- 34 3/4
Am. Rad., com..... 420	Nat. En. & Stm., pref. .... 96 - 97 1/2
Am. Ship, com... 63 - 72	N. Y. Air Brake.. 157 1/2-160 3/4
Am. Ship, pref.. 93 - 94	Pitts. Stl., pref.. 104 1/2-105
Am. Steel Fdries. 63 - 66 3/4	Pressed Stl., com. 72 - 75 1/4
Bald. Loco., com. 84 - 89 3/4	Pressed Stl., pref. .... 104
Bald. Loco., pref.. 106 3/4-108 1/2	Ry. Steel Spring, com. .... 53 3/4- 56
Beth. Steel, com. 64 1/2- 67 3/4	Ry. Steel Spring, pref. .... 101 3/4-101 1/2
Beth. Steel, pref.. 140 - 150	Republic, com... 77 1/2- 80 3/4
Cambria Steel ..... 140	Republic, pref.. 114 1/4-114 3/4
Carbon Steel, 1st pref. .... 115 - 118	Sloss, com. .... 62 - 72 3/4
Carbon Steel, 2nd pref. .... 80	Sloss, pref. .... 98 1/4-103 3/4
Case (J. I.), pref. 84 3/4- 87 3/4	U. S. Pipe, com.. 25 1/4- 26 1/2
Central Fdry., com. .... 16 - 18	U. S. Pipe, pref.. 62 1/2- 65 3/4
Central Fdry., pref. .... 32 - 34	U. S. Steel, com.. 118 3/4-123 1/4
Chic. Pneu. Tool. 72 - 73	U. S. Steel, pref.. 121 3/4-123
Colo. Fuel ..... 52 1/2- 55 3/4	Un. Steel Alloy.. 47 - 49
Cruc. Steel, com. 89 1/2- 96 1/2	Va. I., C. & Coke 56 - 58 1/2
Cruc. Steel, pref.. 122 1/2-123	Warwick ..... 9 7/8- 10
Deere & Co., pref. 96 1/4- 96 1/2	Westing. Elec... 63 3/4- 67 3/4
Driggs-Seabury . 85 - 98 1/2	
Gen. Electric.... 181 - 184 1/2	

## Dividends

The Pittsburgh Steel Company, regular quarterly, 1% per cent on the preferred stock, payable Dec. 1.

The United States Steel Corporation, regular quarterly, 1% per cent on the preferred stock, payable Nov. 29, and 1% and extra 1 per cent on the common, payable Dec. 30.

The Inland Steel Company, regular quarterly 2 per cent, payable Dec. 1.

The Great Northern Iron Ore Properties, 75 cents a share, payable Dec. 20. A dividend of 50 cents a share was declared in May.

The Eastern Steel Company, regular quarterly, 1% per cent on the first preferred stock and an extra of 28 per cent, being the remainder of accrued dividends, payable Dec. 15.

The American Radiator Company, regular quarterly, 1% per cent on the preferred stock, payable Nov. 15, and 4 per cent on the common, payable Dec. 30.

The International Harvester Company of New Jersey, regular quarterly, 1% per cent on the preferred stock, payable Dec. 1.

The International Harvester Corporation, regular quarterly, 1% per cent on the preferred stock, payable Dec. 1.

The By-Products Coke Company, regular quarterly, 1 1/2 per cent and extra 1 per cent.

The Yale & Towne Mfg. Company, extra 5 per cent, payable Nov. 10.

The Standard Sanitary Mfg. Company, extra, 1 per cent on the common stock in addition to the regular quarterly dividends of 1% per cent on the preferred and of 1 1/2 per cent on the common, all payable forthwith.

The Canada Foundries & Forgings Company, Ltd., regular quarterly, 1% per cent on the preferred stock and 3 per cent on the common and an extra of 3 per cent on the common,

The Crucible Steel Company of America has issued its sixteenth annual report, covering operations for the fiscal year ended Aug. 31, 1916. Our space will only permit at this time the statement that the report shows net profits for the year of \$13,223,655.05, against \$3,073,749.73 for the preceding year, and that Chairman Herbert DuPuy says that the company "has paid from profits during the year its entire banking liabilities and will pay all liquid obligations before the new year, and during the coming year it is hoped to be able also to gradually liquidate a considerable portion of the deferred dividends due on the preferred shares."

An additional third floor has been engaged and plans are on foot to use the fourth floor of the Grand Central Palace, New York, for the third National Exposition of Chemical Industries in the fall of 1917.

## Carbon Steel Company's Good Year

The annual report of the Carbon Steel Company, Pittsburgh, for the year ended Sept. 30, 1916, gives the following condensed surplus account:

Surplus Oct. 1, 1915.....	\$132,687.77
Net profits for year ended Sept. 30, 1916.....	\$3,099,610.75
Sundry adjustments .....	1,336.44
Total .....	3,100,947.19
Deduct:	\$3,223,634.96
Cash dividends as follows:	
8 per cent on first preferred.....	40,000.00
6 per cent on second preferred.....	90,000.00
6 per cent on common.....	180,000.00
Depreciation, reorganization expenses, bond premiums, doubtful accounts and losses on former subsidiary companies.....	476,361.47
Additional reserve for Federal income tax.....	50,000.00

Balance surplus Sept. 30, 1916..... \$2,397,273.19

President Charles McKnight, in his accompanying remarks, says: "During the year, in addition to the retirement of the \$891,000 collateral trust notes, all other notes of the company have been retired, so that the company is now free from all floating indebtedness, excepting current monthly bills for materials and supplies.

"The first and second mortgage bonds, issued by the Carbon Iron Company, aggregating \$700,000, payment of which was extended by your company April 1, 1912, for a period of five years, will mature April 1, 1917. Your company now holds in its treasury \$98,000 of these bonds, which have been purchased in the open market, and there are now in the hands of the trustees \$700,000 (unissued) 5 per cent sinking fund gold bonds of the Carbon Steel Company. It is the intention of your officers to retire the outstanding first and second mortgage bonds at maturity, April 1, 1917, out of the funds of the company, without increasing the company's indebtedness. This will leave in the treasury of the company \$1,470,000 of the 5 per cent sinking fund gold bonds, which may be used as your directors see fit from time to time.

"In March last your directors leased the mill of Moorhead Brother & Co., Inc., in Sharpsburg, and at that time entered into a contract to furnish the Italian Government with 30,000 tons of finished bars. The material for these bars was purchased in the outside market, and the contract will be completed within the next 30 days.

"A conservative estimate of the value of contracts and orders now on hand for the company's regular line of products shows an increase of more than \$1,500,000 over a similar estimate made at the beginning of the year. This increase does not include orders or contracts which will be received from time to time in the regular course of business."

## Prices for British Shells

A British blue book just issued contains evidence presented to the committee on public accounts, showing how the Ministry of Munitions compelled firms to reduce their prices for shells. After consulting accountants and engineers and arriving at what they considered the actual cost, they cut the prices of shell bodies by 25 to 30 per cent. The following instances were cited: 18-pounders, formerly 20s. to 23s., cut to 12s. 6d.; 4.5-in. shells, formerly 47s. to 65s., cut to 33s. 6d.; 60-pounders, formerly 63s. to 82s. 4d., cut to 52s. 6d.; 6-in. shells, formerly 80s. to 99s., cut to 70s.; 9.2-in. shells, formerly £13 2s. 6d. and £15 5s., cut to £11 7s. 6d.

The American Steel & Wire Company, in announcing advanced prices on wire products, has made an important change in its prices on wire nails to retailers. Heretofore it has asked 15c. per keg more on less than carload lots to retailers than the price named on carload lots to jobbers. This differential has been raised to 25c. per keg.

A plant for the manufacture of cold-rolled strip steel will be erected in Dover, Ohio, by H. C. Greer of Morgantown, W. Va. Some of the contracts have been placed, and it is expected that the plant will be in partial operation by April 1.

## OBITUARY

WILLIAM COOPER CUNTZ, managing director of the Goldschmidt Thermit Company, 120 Broadway, New York, died Nov. 3, at Auburndale, Mass., aged 45 years. He was born and educated in Hoboken and started his business career with the Pennsylvania Steel Company and later went to Boston, Philadelphia and London, England, for the company. He became connected with the Goldschmidt Thermit Company in 1910. He was a member of the American Society of Civil Engineers, Engineers' Club, Chemists' Club, University Club of Philadelphia and other societies.

JOHN T. WILSON, for many years a partner in the firm of Wilson, Walker & Co., Ltd., operating bar-iron mills in Pittsburgh, died at Atlantic City, N. J., Oct. 29, aged 86 years. The Wilson-Walker plant is now the lower Union mills of the Carnegie Steel Company.

DAVID COLVILLE, managing director of David Colville & Sons, Ltd., Dalzell Steel & Iron Works, Motherwell, England, died Oct. 16 after a brief illness.

JULIUS BERBECKER, president Berbecker & Rowland Mfg. Company, Waterville, Conn., died Sept. 25, aged 84 years.

## PERSONAL

Thomas E. Durban, Erie City Iron Works, Erie, Pa., chairman of the Administrative Council of the American Uniform Boiler-Law Society, organized to bring about the legal adoption of the boiler code of the American Society of Mechanical Engineers, has been asked to serve in an advisory capacity with the Industrial Board of New York State to draw up a boiler code.

G. V. Rottweiler has resigned as works manager and chief engineer of the Davis Sewing Machine Company to go into business for himself with Columbus, Ohio, associates, as general manager of the Paramount Motor Company, manufacturer of motor bicycles, bicycles and bicycle parts.

A. D. Race, DePere, Wis., who has purchased an interest in the Luther Grinder Mfg. Company, Milwaukee, has been elected treasurer and will participate actively in the management.

Fred S. Cadmus has resigned as resident engineer of the American Bridge Company, Ambridge, Pa., and has assumed the position of general manager of the plants of the McClintic-Marshall Company at Pottstown, Pa., succeeding W. M. Sterrett, who since the completion of the company's contract on the Panama Canal has been located at its Philadelphia offices.

Ray W. Light of Lebanon, Pa., has been made superintendent of the Bessemer department of the Cambria Steel Company at Johnstown.

The Transue & Williams Steel Forging Corporation, Alliance, Ohio, has elected the following board of directors: O. F. Transue, president of the company; Frank Transue, vice-president; F. E. Dussel, secretary and treasurer; W. H. Transue, Harry R. Jones, president United Alloy Steel Corporation; G. E. Farnsworth, cashier First National Bank of Cleveland, and John W. Prentiss of Hornblower & Weeks.

Arthur Harrop, for 14 years with the sales department of the American Hardware Company, New Britain, Conn., most of that time with the Corbin Screw division, has resigned to become sales manager of the Frank Mossberg Company, Attleboro, Mass.

David Potter has been promoted to purchasing agent of the Seth Thomas Clock Company, Thomaston, Conn., to fill the place made vacant by the resignation of J. C. Ames.

A. W. Petersohn, who for the past two years has had charge of department 18 (tool room) of the Aurora Automatic Machinery Company, Aurora, Ill., has been

promoted to the position of supervisor of piece rate and lay-out departments.

R. S. Ramsey, formerly with the Pressed Steel Car Company, has accepted the position of manager of the Bellwood Mfg. Company, founder and machinist, Bellwood, Pa.

Albert L. Fay, for many years with the Holland Core Oil Company, has resigned and is now associated with the Werner G. Smith Company of Cleveland as its Chicago manager.

A. F. Faulhaber has joined the sales force of Crocker Brothers, pig-iron merchants, and will travel out of the Cincinnati office, which is in charge of Herbert F. Topp.

Edward S. Illig, for years San Francisco sales manager for the Bethlehem Steel Company, has been made sales manager of the Pittsburgh office of the company.

Norman L. Warford, until Nov. 1 in charge of the powdered coal department of the Anaconda Copper Mining Company, Anaconda, Mont., has become identified with the Powdered Coal Engineering & Equipment Company, Chicago, in the capacity of engineer in charge of construction. He is credited with having installed the largest powdered coal plant in the United States for the Anaconda Company at its several works, wherein approximately 1000 tons of pulverized fuel is daily burned.

W. H. Foster, president General Fireproofing Company, Youngstown, Ohio, has been elected president of the Association of Metal Furniture Manufacturers of the United States, which held a meeting in Chicago last week.

Philip Frankel, who has been secretary and an active executive officer of the Cleveland branch of the National Metal Trades Association, Cleveland, since it was organized, has tendered his resignation to take effect at the end of his present term, March 1, 1917, or sooner if some one is found to relieve him of his duties. His brother, Frederick Frankel, who has been associated with him for several years as assistant secretary, leaves with him. They will sever their connection with the association to devote their time to larger and broader association work, including various problems that confront manufacturers and the legal end of labor problems and labor troubles. They have moved to new offices at 1019-20 Guardian Building, where they will continue the general practice of law under the firm name of Frankel & Frankel.

### Triple Supply Convention in Memphis

The officers of the Southern Supply and Machinery Dealers' Association, National Supply and Machinery Dealers' Association and American Supply and Machinery Manufacturers' Association have completed the preliminary arrangements for a triple convention to be held in Memphis, Tenn., April 12-13-14, 1917; headquarters, Chisca Hotel. Memphis is stated to be a convention city of a high order. It knows how to take care of a large crowd satisfactorily. The people of Memphis were anxious to have the triple convention held there last spring, but gracefully yielded to Pittsburgh, and are now looking for a great gathering in April in their own city.

The United Smelting & Aluminum Company, New Haven, Conn., now operating a large plant in Commerce Street, has begun the construction of a new plant at State and Edmund streets, where five acres of land has been purchased, with a frontage of 1000 ft. on the Hartford division of the New Haven Railroad, and it will erect five buildings to be used in smelting aluminum, the first building to be 100 x 200 ft., one story. The business of the company has increased so greatly that the Commerce Street plant also will be kept running permanently.

The Industrial Commission of Ohio has called a meeting of representatives of all the states in the Union to discuss boiler legislation. The meeting is to take place in the week of Dec. 4 at the Willard Hotel, Washington, D. C.



## HOW IS GRAY IRON DEFINED?

### Gray-Iron Founder Wins Legal Controversy Over Classification of Iron

At the meeting of the Philadelphia Foundrymen's Association, Philadelphia, on the evening of Nov. 1, George C. Davis, of that city, analytical and consulting chemist, read a paper entitled "What Is Gray Iron?" He said in part:

In May, 1913, a case was tried in our local courts which brought out some novel points that might involve any foundryman, and I believe it would be of interest to give a brief résumé of the case and the arguments on each side.

It has not been possible to present this paper at an earlier date, as a new trial was granted. This was delayed for various reasons, and it was only last spring that the case was finally settled. The verdict in the second trial was the same as the first—for the plaintiff and for the full amount claimed. While my paper is an account of the first trial, with which I am more familiar, the main points at issue and contentions were the same each time.

Smith & Co. (sub-contractors for the Panama Canal) ordered from Jones & Co. (who were gray-iron founders) certain sheave wheels which were about 8-in. in diameter and weighed about 30 lb. It was specified they were to be of gray iron, chilled and to meet U. S. specifications. A blue print was furnished with chill line shown, but without dimensions given. The foundry made the castings out of soft iron with a chill on the face. Of course, the castings did not chill appreciably, but only showed a closing of the grain and a faint surface chill. These castings were rejected by the U. S. inspector, and after a second attempt, which also failed, they were successfully made by Robinson & Co. (who were carwheel founders) at a much higher price.

Jones & Co. sued Smith & Co. for the price of the castings furnished and rejected. It was conceded by both sides that gray iron had been ordered, and that a chill was to be used. The foundrymen (Jones & Co.) contended that they had never received the U. S. specifications, knew nothing about them, and that the blue print furnished was indefinite, as no chill dimensions were given.

#### VERDICT GIVEN FOR PLAINTIFF

The case turned on what is gray iron, and resulted in a verdict for the plaintiffs (Jones & Co.) for the full amount. It was contended by them that they had tried faithfully to fulfill an impossible contract; that gray iron in the commercial world had a certain definite meaning; that it was a soft, fluid iron suitable for stoves, radiators, light machinery, etc.; that such iron could not be chilled by any ordinary foundry practice. In short, if they furnished gray iron it was impossible to chill it; as subsequent evidence showed the U. S. specifications required, and on the other hand if they furnished an iron that would chill as required it was not gray iron. The defendants (Smith & Co.) claimed that there were only two kinds of iron, namely, white and gray; and further, that gray iron could be chilled, as the Pennsylvania Railroad in its carwheel specifications called for gray iron in the center. This being the fact, they claimed that the foundry should have known the proper variety of gray iron to use; that is, carwheel iron. The claim of the defendants was supported by their principal witness, who was manager for Robinson & Co. and a man of long experience in the iron trade.

The contentions about the depth of chill and whether the U. S. specifications were forwarded by Smith & Co. to Jones & Co. are not germane to this discussion, but the widely divergent views on what is gray iron certainly suggest the question of one of our statesmen, "Mr. Chairman, where am I at?"

#### GRAY IRON INCLUSIVE TERM

It is my own belief, and as witness for the plaintiff I so testified, that gray iron has a definite meaning

in the trade. How shall we define it and what are its limitations? When does a casting cease to be gray and begin to be something else? I think a glance over the advertisements and market reports in the trade papers will show the following facts: There is a class of foundries advertising as gray-iron foundries who use soft, fluid iron, usually No. 1 or No. 2X, with scrap from castings of a similar composition, and who make therefrom castings such as stoves and radiators and various small articles, such as parts of small machines and toys. There is also a class of foundries who make a heavier work, and in this we may include castings such as engine beds, flywheels, machine-tool castings, roll housings, sugar machinery and the like. These are all gray iron, but when we turn to market reports and read the pig-iron sales, one begins to note a difference in terms. Instead of No. 1 and No. 2X we read "Special No. 2X," "analysis iron," or "pipe iron." I do not intend this as a slur on the pipe foundries, which usually also produce other heavy work. What they do is simply this. As large buyers they can purchase "misfit" iron from various sources. They employ chemists trained in their line of work, and can thus balance the deficiencies of one lot against the excesses of another, producing therefrom a suitable mixture. Proceeding a step further, that is, toward a class of castings still lower in silicon, such as carwheels, chill rolls, etc., we have a class of castings that, while relatively soft in the center and capable of being machined, are entirely distinct in composition from either of the preceding classes. To my mind they cannot be considered as gray iron by any ordinary use of the word. We have then three classes of castings, which may be roughly classed as follows:

Light castings with silicon, from.....	2	to 2.50
Light castings with phosphorus, from....	0.5	to 0.80
Heavy castings with silicon, from.....	1	to 2
Heavy castings with phosphorus, about...	0.50	
Chilled castings with silicon, from.....	0.50	to 1.00
Chilled castings with phosphorus, from...	0.20	to 0.40

Referring again to pig-iron quotations, we have the anomalous conditions that, as dealt in, many irons are gray that are never known as such. To illustrate my point, malleable Bessemer, when sand cast, is gray, and so is No. 2 charcoal. It might be urged that castings could be classified by the amount of graphite. Ordinary small castings are usually wanted as soft as possible, very often too soft for the purpose. This is on account of the demands on the machine shop where various automatic machines are geared at their highest speed to give a big output.

As matters stand, there is much confusion in all branches of the iron trade. So far as I know there is no generally accepted definition of steel; the same may be said of wrought iron. It ought not to be difficult to agree on a fairly satisfactory definition for gray iron.

#### New Steel Casting Plant at Akron

The Acme Steel Company, Akron, Ohio, recently incorporated, will establish a plant for the manufacture of converter steel castings of medium weight, beginning with a capacity of about 10 tons per day. John H. Davis, formerly of Cleveland, and now superintendent of the Chester Steel Casting Company, Chester, Pa., will take charge as superintendent Nov. 15. The company has leased the former power buildings of the Northern Ohio Traction & Light Company, in Akron, and these are now being remodeled and equipped. They are twin buildings, of brick and steel construction, over 200 ft. in length, each about 50 ft. wide, and equipped with a 25-ton traveling crane. A Baltimore & Ohio siding is laid into one of the buildings. The company has an initial capital stock of \$60,000. The officers are H. H. Whiting, president and general manager; James H. Miller, vice-president, and C. A. Spencer, secretary and treasurer. Offices have been opened in the Medford Building, Akron.

The Lehigh Valley Railroad has recently completed the laying of a spur track from its Bound Brook & Perth Amboy branch to the outskirts of New Brunswick, N. J., about a mile distant, giving that city valuable additional freight facilities.

## Questionnaire on British Iron Works Practice

An attempt is to be made to ascertain what steps are necessary to improve the economy and efficiency of blast furnaces and steel works in Great Britain. At the recent meeting of the British Association at Newcastle-upon-Tyne, the metallurgical committee brought in a report stating that a series of questions had been submitted to the iron and steel manufacturers of the country, the answers to be based as far as possible on pre-war practice. The following are the questions:

*Blast Furnaces*

Coke required to make one ton of pig of:

- 1.—Foundry iron (Lincolnshire, Staffordshire, Cleveland, etc., No. 3 quality).
- 2.—Basic pig
- 3.—Hematite (Nos. 1, 2 and 3).
- 4.—Ferromanganese (80 per cent).
- 5.—Spiegel (11 to 20 per cent silicon).
- 6.—Silico-spiegel.
- 7.—What is the loss of gas and heat caused by lowering the bell when charging the furnace, per ton of pig?
- 8.—What is the loss of heat in the burnt gases from stoves and boilers, and how is this calculated?
- 9.—What is the temperature and analysis of waste burnt gases, and how is this determined?
- 10.—Has the heat of pig and slag been applied to any useful purpose?
- 11.—Has dry air been applied to the blast furnace; if so, has economy resulted and to what extent; if not, have you any evidence on coke consumption during frosty weather and damp summer weather?
- 12.—Has the gas from furnaces been cleaned from dust, and if so, has economy followed the use of clean gas in stoves and boilers?
- 13.—Are steam or gas engines employed for blowing the air into furnaces?
- 14.—If gas engines are used, how is the surplus furnace gas utilized?
- 15.—What kind and quality of fuel is required to calcine Cleveland and other ironstones per ton of pig?
- 16.—Is furnace gas used for calcination; if not, what kind of fuel is employed?
- 17.—Is it necessary to use coal for steam raising or other purposes in the production of pig-iron?
- 18.—Is coal used in the blast furnace; if so, how much per ton of the pig introduced is required?
- 19.—Is the exhaust heat from the steam engines utilized?
- 20.—What is the total of coal and coke used per ton of pig?

*Steel Works*

- 21.—What is the total amount of coal per ton of steel ingots produced in Siemen's furnace? State capacity of furnaces and whether basic or acid.
- 22.—If using cold pig and cold scrap give amount of each in cwts.
- 23.—If using liquid iron and cold scrap, give amount of each in cwts.
- 24.—What weight of coal per ton of ingots is used: (a) for heating furnaces; (b) for heating ladles; (c) for metal mixers; (d) for other purposes.
- 25.—What is the temperature and composition of the waste gases at chimney base of steel-melting and heating furnaces?
- 26.—What coal is used for steam raising: (a) For working producers; (b) for locomotives, cranes and other powers in connection with steel production only?

*Steel Mills*

- 27.—What weight of coal is used for steam rolling mills per ton of ingots rolled, giving sizes of ingots and amount of work done, with particulars as to sections rolled?
- 28.—What coal or equivalent in gas is used in soaking pits?
- 29.—What coal or equivalent in gas is used for reheating bars and blooms, giving size of blooms reheated?
- 30.—What is the temperature and composition of the escaping gases (stating number of samples averaged) (a) from soaking pits; (b) from reheating furnaces?
- 31.—What is the temperature and composition of the waste gases from steam-raising boilers?
- 32.—Is the heat in the exhaust from steam engines utilized; if so, in what way and to what extent?
- 33.—Is Mond gas, or gas produced by any kindred process, used for steel melting; if so, state: (a) The amount of steam used for producers; (b) the amount of coal used per ton of steel ingots; (c) net saving in coal and fuel, if any, compared with coal used in ordinary producers; (d) quality of coal used—washed or unwashed slack, small, or nuts.

## BRITISH STEEL EXPORTS

## September Shipments Lowest for More Than a Year—Imports Declining

Exports of iron and steel from Great Britain in September, made up mostly of supplies sent to the Allies, were 231,335 gross tons, excluding iron ore and including scrap. This compares with 319,928 tons in August. The September exports are the smallest since February, 1915, when they were 198,804 tons. Government prohibitions are having more and more effect. The average for the first nine months of this year was 303,708 tons, comparing with a monthly average in 1915 of 270,858 tons.

Pig-iron exports for September were 65,110 tons, against 43,183 tons in August this year and 46,494 tons in September, 1915. To Oct. 1, 1916, total pig-iron exports were 647,475 tons, as compared with 298,359 tons to Oct. 1, 1915. Of this year's total France took 438,011 tons and Italy 104,373 tons.

Ferromanganese exports in September were about 7500 tons, against 6500 tons in September, 1915. To Oct. 1, 1916, they were about 99,000 tons, contrasting with 73,000 tons to Oct. 1, 1915. The present export rate is therefore about 11,000 tons per month as compared with only about 8000 tons per month in the same period a year ago.

Steel-bar exports in September were 31,486 tons (24,384 tons going to France), against 35,853 tons in September, 1915. The total to Oct. 1, 1916, was 498,073 tons as compared with 343,647 tons to Oct. 1, 1915. France has taken 420,210 tons this year. Rail exports in September were only 2712 tons, in contrast with 15,800 tons in September, 1915. The total rail exports to Oct. 1, 1916, were only 36,458 tons, against 205,952 tons for the same period in 1915.

The movement in galvanized sheets continues at about 50 per cent of last year's. The total for the first nine months of this year was 110,332 tons; for the same months in 1915 it was 238,480 tons. Tin-plate exports continue about the same. In September they were 19,226 tons against 20,002 tons in September, 1915. The total exports to Oct. 1, 1916, were 280,122 tons against 280,437 tons to Oct. 1, 1915. France took 57,867 tons this year.

Imports of iron and steel in September, excluding iron ore and including scrap, were unusually small—66,657 gross tons against 72,033 tons in August, 1916, and 144,360 tons in September, 1915. The record month for 1916 was May with 86,303 tons. The monthly average for 1915 was 107,944 tons.

Blooms, billets and slabs imported in September were 10,802 tons, comparing with 20,104 tons in August of this year and 43,091 tons in September, 1915. The total to Oct. 1, 1916, which was 117,800 tons, was only one-third of that for the same period last year—359,867 tons. Of the former total the United States supplied 95,259 tons against 289,220 tons last year.

Iron-ore imports in September were large—602,288 tons against 469,879 tons in September, 1915. The total to Oct. 1, 1916, was 5,481,509 tons compared with 4,709,046 tons to Oct. 1, 1915.

The valuation of the steel exports for the first nine months of this year is reported at £45,147,916 against £28,923,683 for the same nine months of 1915. The valuation of steel imports for the first nine months of this year is put at £8,889,530 against £8,121,431 to Oct. 1, 1915.

The Moore & Scott Iron Works, whose shipyard is at Oakland, Cal., launched its first large steel vessel Oct. 14. It is intended for carrying freight, has a cargo capacity of 7100 tons, is being built for Norwegian interests and is named *Capto*. The launching was made the occasion of a great gathering of distinguished people, and the wife of Mayor Rolph of San Francisco performed the christening. The vessel was launched five weeks ahead of the contract time. The *Capto* is one of a type which the shipbuilding company is attempting to standardize, other vessels of its class having been planned for construction.



### Westinghouse Electric Company's Welfare Work

Some of the activities of the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., in its endeavor to take care of its employees are briefly described in a pamphlet which has just been issued entitled, "The Worker and the Works." The company has taken the stand that there is no inherent reason why a man's occupation, the comfort of his home life and the development and education of his children should not go hand in hand. It has therefore made an earnest endeavor to afford its employees opportunities for social and educational advancement. These include among other things the use of guards, inclosures and warning signs to lessen the danger of accidents in the plant; the publication of a shop magazine containing safety and health hints, accounts of social activities, suggestions for methods of improvement in the works, descriptions of processes and systems employed in the shop and other items of general interest; a club and technical night school for the employees; relief, compensation and pension plans; a suggestion system; a savings fund; picnics; lunchrooms and counters, and a number of other features which, although in a sense outside of the general scope of manufacturing, have contributed in a large measure toward the building up of desirable communities in which to live. All of the various activities are described at some length and the pamphlet is illustrated with a number of views taken in the shop, at the Westinghouse Club and in the technical school. The work of the relief department of the company was described at some length in THE IRON AGE, Dec. 31, 1914.

### Pennsylvania's Annual Safety Congress

The Fourth Annual Welfare and Efficiency Conference of the State of Pennsylvania will be held in Harrisburg, Nov. 21, 22 and 23 under the auspices of the Department of Labor and Industry and with the co-operation of the Engineers' Society of Pennsylvania. A paper, "Nine Months of the Workmen's Compensation Law in Pennsylvania," by Harry A. Mackey, will be discussed by A. B. Farquhar, president A. B. Farquhar Company, York, Pa., from the standpoint of the manufacturer. "Hiring and Firing—An Economic Waste" will be presented by Magnus W. Alexander, General Electric Company, West Lynn, Mass., on Tuesday, Nov. 21, at the evening session. Other papers include: "The Accident Problem in the Iron and Steel Industries," by J. H. Herbert, superintendent safety department, Cambria Steel Company, Johnstown, Pa.; "The Employer's Duty Toward Accident Prevention," by George T. Fonda, safety engineer, Bethlehem Steel Company, South Bethlehem, Pa., with the general discussion opened by Lew R. Palmer, chief of bureau of inspection, Pennsylvania Department of Labor and Industry, both on Wednesday morning, Nov. 22. "Medical Supervision of Workmen and Its Relation to the Prevention of Industrial Accidents," by Dr. Loyal A. Shoudy, Bethlehem Steel Company, South Bethlehem, Pa., and "The Relation of the Industrial Physician to the Problems of Modern Industry," by Dr. J. W. Schereschewsky, United States Public Health Service, Pittsburgh, are scheduled for Thursday morning, Nov. 23.

### Standard Roller Bearing Company's Loss on Shellwork

The answer of Robert S. Woodward, Jr., and S. Lawrence Bodine, receivers of the Standard Roller Bearing Company, Philadelphia, to a petition filed in the United States District Court by John S. Stanton, Frederick P. Fiske and Merrill Bishop, stockholders of the company, showed specifications in hand Sept. 30, 1916, for \$1,400,000 worth of products besides \$1,000,000 worth, sold for delivery next year, on which specifications have not been received.

In June, 1915, the receivers entered into a contract with Gaston, Williams & Wigmore, New York, for the machining of shell bodies. After some time the labor situation suddenly changed, due to the large increases in wages for this class of work. It was necessary to

train employees specially in the work and it was found that after receiving their instruction many left to accept positions with munition manufacturers at greatly increased wages. The receivers were unable to meet these wages. Had they done so a general increase throughout the plant would have been necessary, which would have caused a loss in the conduct of the general business. It was decided best to sublet the contract upon such terms as would relieve the receivers from any further liability. The receivers deny that the loss was \$100,000 on this undertaking and say that it was \$25,000.

The plant is operated day and night to its capacity, and inasmuch as the profits from Oct. 21, 1913, to Sept. 30, 1916, have been nearly \$750,000 the receivers believe the best interests of the stockholders and creditors would be served by continuing it as a going business until an acceptable plan of reorganization is proposed.

### Present Condition of Copper Exports

While the exports of copper from the United States as pigs, ingots, bars, etc., since the war has at no time attained the proportions before the war, when about one-third reached Germany, the present export rate very nearly approximates that of the large outgo in 1913 and 1914. In May, June and July, this year, the exports were 33,104 tons, 35,772 tons and 34,270 tons respectively, the average of which is 34,382 tons or at the rate of 412,584 tons per year. This compares with the following data, compiled from Government figures:

Period	Total, Gross Tons	Per Month, Gross Tons
To Aug. 1, 1916 (seven months)...	203,377	29,054
Fiscal year ended June 30, 1916...	317,672	26,472
Fiscal year ended June 30, 1915...	302,300	25,191
Fiscal year ended June 30, 1914...	435,130	36,260
Calendar year, 1915.....	304,443	25,370
Calendar year, 1914.....	375,036	31,253
Calendar year, 1913.....	413,500	34,458
May, June and July, 1916.....	103,146	34,382

It is seen that the rate for the last three months is very close to that of the record in 1913.

Of exports to Aug. 1, 1916, France took 95,671 tons; the United Kingdom, 49,654 tons, and Italy 25,767 tons.

Exports of brass and manufactures of to Aug. 1, 1916, were valued at \$157,883,598, which contrasts with exportations to Aug. 1, 1914, valued at \$4,248,656, revealing an extensive outgo of copper in this form.

### Firms on the British Blacklist

The number of foreign firms with which, according to the British statutory list (made up to and including Sept. 29, 1916), trading is prohibited is 1853, distributed in the following numbers among the various countries: Argentina and Uruguay, 115; Bolivia, 34; Brazil, 171; Central and South America (all countries), 5; Chile, 50; Colombia, 16; Cuba, 10; Denmark, 36; Ecuador, 74; Greece, 63; Iceland and Faroe Islands, 5; Japan, 93; Liberia, 13; Morocco, 91; Netherlands, 162; Netherlands East Indies, 95; Norway, 97; Paraguay, 2; Persia, 56; Peru, 48; Philippine Islands, 50; Porto Rico, 2; Portugal, 77; Portuguese East Africa, 76; Portuguese West Africa, Portuguese Guinea, Fernando Po and Rio Muni, 12; Spain, 201; Sweden, 90; United States, 81; Venezuela, 28.

It is announced that the Texas Iron & Steel Company, Beaumont, has obtained "the exclusive right for Texas to employ the Bradley process of ore reduction" and that it plans to build furnaces at some point in eastern Texas within convenient distance of the natural gas field at Caddo, La. The company is reported to own extensive deposits of iron ore in Cass, Marion, Anderson and other counties.

A chart entitled "Steel Hopper Bottom Coal Car" has just been issued by the Norman W. Henley Publishing Company, New York. It was prepared by George L. Fowler and shows the anatomy of a steel hopper bottom coal car, having every part of the car numbered, with its proper name given in a reference list.

## Pittsburgh and Nearby Districts

The Petroleum Iron Works Company, Sharon, Pa., has let contracts for a new steel main building and equipment that will increase its capacity about 25 per cent. The new addition will be 120 x 150 ft., and will be built by the Fort Pitt Bridge Works, Pittsburgh. A new heating system is also being installed in the present plant.

The Youngstown Sheet & Tube Company, Youngstown, has given notice that on Jan. 1, 1917, it will redeem all outstanding bonds, consisting of \$1,250,000 first and collateral series dated July 1, 1905, and \$455,000 sixth serial on its Struthers, Ohio, plant, which consists of rod, wire and wire nail mills, and which it bought from the Morgan Spring Company, Worcester, Mass., some years ago. The company will pay \$105 for the bond, par value being \$100, as they are to be taken up before the date of maturity. The entire sum to be paid for the bonds will be \$1,790,000.

The Standard Car Construction Company, which is erecting a large plant at Masury, near Sharon, Pa., for the manufacture of steel tank cars, expects to have it completed in December. The company states it has already received enough orders to take its entire output for the first quarter of 1917. C. H. Todd, who was formerly president of the Petroleum Iron Works Company at Sharon, is president of the Car Construction Company.

The American Steel & Wire Company will build a large office building at its works at Sharon, Pa. An addition will also be made to the galvanizing plant.

The board of directors of the Standard Sanitary Mfg. Company, Pittsburgh, has decided to increase its capital stock from \$10,000,000 to \$20,000,000. Of the increase \$4,000,000 will be preferred and \$6,000,000 common.

The Pittsburgh Visible Spark Plug Mfg. Company has been incorporated with a capital of \$50,000 to manufacture spark plugs. The incorporators are William Boyd Winloft and Charles H. Jones of Wilmington, Del.

Record outputs for production of steel were made in October in the Bessemer and open-hearth steel plants at the Ohio works of the Carnegie Steel Company, also by the Youngstown Sheet & Tube Company and Republic Iron & Steel Company, and in the open-hearth department of the Brier Hill Steel Company. It is stated the output of ingots at the Ohio works of the Carnegie Steel Company that month was 137,000 tons. It is also said that the Carnegie Company's plants in the Youngstown district broke no less than 35 output records in October. Its 43-in. mill on a 12-hr. turn rolled 943 ingots, or an ingot about every 43 seconds. The Brier Hill Steel Company turned out over 50,000 tons of ingots and the Bessemer and open-hearth plants of the Youngstown Sheet & Tube Company turned out 121,526 tons of Bessemer and open-hearth ingots. It is also said that the Republic Iron & Steel Company turned out close to 100,000 tons of Bessemer and open-hearth steel ingots.

Ground was broken last week at New Castle, Pa., for the new plant of the Pull-More Motor Truck Company, which is capitalized at \$800,000. The plant is expected to be ready for the manufacture of motor trucks for commercial purposes early in the new year.

The Union Electric Steel Company, recently organized at Pittsburgh, with a capital of \$350,000, has bought a site of three acres at Carnegie, Pa., on which it will build a plant and expects to be making steel by April 1. It will install at the beginning a 6-ton Heroult electric furnace, but the plant will be arranged to make extensions later on. The furnace is being built for the company at the Ambridge, Pa., works of the American Bridge Company. The site at Carnegie adjoins the plant of the Alloy Steel Forging Company, and it is said the latter will take part of the product of the new plant. James D. O'Neil, formerly connected with the United Coal Company, is president; H. O. Murphey, secretary and treasurer, and W. J. Walker, formerly connected with the elec-

tric steel plant of the Universal Rolling Mill Company, Bridgeville, Pa., is general manager.

It is stated that the Jones & Laughlin Steel Company, Pittsburgh, in order to insure an adequate supply of coal for the winter months, has closed contracts for large quantities with independent mining companies. The Vesta Coal Company and other smaller coal-mining properties are owned by the company, but it was feared their output would not be sufficient for its requirements.

The November meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers will be held on Saturday evening, Nov. 18, in the Fort Pitt Hotel, Pittsburgh, preceded by a dinner. David Wright will talk on "Variable Speed Alternating Current Motors for Mill Drive." W. O. Oschmann, 2417 Osgood Street, Pittsburgh, is secretary of the section.

The Youngstown Foundry & Machine Company, Youngstown, recently made a shipment of three lathes for machining 18-in. rolls, having some new features, to the Crescent works of the Crucible Steel Company of America, at Pittsburgh. All gears in the head stocks of these lathes are inclosed in a cast-iron housing filled with oil.

The business of Samuel Trethewey & Co., Ltd., Pittsburgh, manufacturer of solid steel shear knives, has been incorporated as the F. Tinker & Sons Company. There has been no change in officers. Francis Tinker is president, and W. R. Tinker secretary and treasurer.

The Ohio Automatic Sprinkler Company, Youngstown, Ohio, will make large additions to its plant which will increase its output about 50 per cent. It makes such equipment as is installed by the Automatic Sprinkler Company of America, of which it is a subsidiary interest. The engineering force of the parent company will be assembled at Youngstown, and a new office building to cost about \$25,000, three stories, will be erected to house the engineering department and the office force.

The Standard Seamless Tube Company, Economy, Pa., is in the market for a 50-ton crane for prompt delivery.

The Penn Bridge Company, Beaver Falls, Pa., has taken a contract for the erection of a one and two-story building, 162 x 219 ft., for the Atlas Car & Mfg. Company, Cleveland. About 200 tons of steel will be used in the new building.

## Standard Chain Company Sold

The Standard Chain Company has been sold to the American Chain Company, Bridgeport, Conn. The Standard Chain Company is estimated to have a capacity annually of 30,000 tons of finished product. It was organized in 1900 and owns and operates plants in York, Carlisle and Braddock, Pa.; Columbus, St. Marys and Mansfield, Ohio, and Marion, Ind. Since its incorporation the principal offices of the company have been located at Pittsburgh, with John C. Schmidt president. W. B. Lasher, Bridgeport, Conn., is president of the American Chain Company.

At the regular meeting of the Detroit Foundrymen's Association, Detroit, Mich., to-night, Nov. 9, there will be a debate on green sand vs. dry sand molds in making automobile cylinder castings. The use of green sand molds will be advocated by a team at the head of which will be Robert Crawford, president Atlas Foundry Company. Emil Horne, manager of the foundry and forging departments of the Packard Motor Car Company, will be captain of the dry sand team.

An industrial safety congress under the auspices of the State Industrial Commission of New York State will be held at the Hotel Onondaga, Syracuse, on Dec. 11, 12, 13 and 14. Addresses are to be made at morning and afternoon sessions on fire prevention, factory sanitation, safeguarding of machinery and other factors entering into industrial safety.



# Machinery Markets and News of the Works

## BUYERS LIMIT PURCHASES

### High Prices Block Machinery Sales

#### Orders Held Down to Small Lots and Single Tools—Present Needs Not Entirely Met, Enhancing Machine-Tool Outlook

All machine-tool centers report a distinct tendency for purchasers of equipment to meet their requirements gradually by contracting only for single tools or small lots up to a half dozen. In many cases early delivery is wanted, indicating that only imperative needs are considered. Deliveries, especially on certain standard lines, continue to ease off; but in spite of this, high prices are a deterrent to much business.

The absence of excited buying is not anywhere taken to indicate that demand is decreasing. Predictions are, on the contrary, being offered that current purchases are but a fraction of what the trade needs and that the business withheld because of present prices is merely postponed. This is taken by some to mean that there will be no recession of buying for many months, and by others that it will outlast the war. Right now one of the leading milling machine builders is booking orders for delivery next September and a maker of radial drills for next July.

The Russian Government is buying scattered lots of special lathes at Chicago. Cincinnati reports that Spanish importers have bought more machine tools lately than ever before. Business to Canada is slowing down; but munition makers there continue to order single tools steadily. Otherwise, export trade displays the same quieter aspect shown by the domestic trade.

The Standard Shipbuilding Corporation is buying against its recent list, and the Pusey & Jones Company, Wilmington, Del., is about to buy heavily for its new shops.

No noticeable distress from non-delivery of fuel or raw materials to manufacturing plants has as yet been reported. Foundries in Ohio are operating to full capacity; but some factories in the northern part of the State are inconvenienced by a soft coal shortage.

## New York

NEW YORK, Nov. 8, 1916.

Deliveries continue to improve, although they are still many months away on some types of machines. Radial drills, for instance, are being ordered for next July. Considering the market as a whole it is somewhat quieter, although the volume of small, scattered orders is large.

Collections on machine tools are fair, but there is some wonderment as to why they are not better, the only answer is that manufacturers are using a great deal of capital in their operations, also making liberal distributions of stock dividends, both regular and extra, while a great deal of money is going into labor.

The Lehigh Valley Railroad has lately purchased a few tools for delivery at its Sayre shops. It recently issued a large list against which it was expected to buy slowly. The Pennsylvania Railroad occasionally buys one or two tools for delivery at Altoona, which it favors as its chief manufacturing point. Its other shops are known to be in need of tools.

The estate of J. K. Stewart is bringing from Chicago machinery which was purchased by the late J. K. Stewart, also buying some additional tools, all of which will be installed in a plant at Jackson Avenue and Second Avenue, Long Island City. Automobile accessory parts will be manufactured.

The Pusey & Jones Company, Wilmington, Del., is about to buy heavily for new shops which it has erected. One of the company's engineers has been making a trip through the West for the purpose of selecting the machines desired. It also has placed with the Norton Company an order for a roll grinder which will cost about \$40,000.

The Standard Shipbuilding Corporation has begun to place orders against the list it issued recently.

The General Electric Company continues to place orders.

The Treadwell Engineering Company, Easton, Pa., is extremely busy in manufacturing rolling-mill equipment. It has been in the market for a few planers.

The Brady Brass Company, Jersey City, N. J., has added a few machines to its equipment. The brass-working trade in Baltimore and Wilmington, manufacturing plumbing goods, principally, is extremely busy, but like other lines has been greatly hampered by the lack of skilled men. Lately there has been a little more ease in this respect and orders have been placed for a few machines.

The Linde Air Products Company, Forty-second Street Building, New York, is preparing plans for factory buildings to be erected in the Central Manufacturing District, Chicago. Ill. W. F. Barrett is works manager.

The American Locomotive Company, 30 Church Street, New York, advises that it has not purchased an acreage at Pittsfield, Mass., as the site of a new plant.

The Creighton Valve Company, 116 Grand Street, Maspeth, Long Island, N. Y., has been incorporated with a capital stock of \$10,000 to manufacture automatic and hand-operated cut-off gas valves for fire prevention. William E. Woodwill, is president; Robert Kunze, secretary, and George S. Jervis, treasurer. The company proposes for the present to use an existing plant.

The Militaire Motor Vehicle Company of America, Buffalo, N. Y., recently increased its capital stock from \$250,000 to \$650,000.

The Sanitary Brass Works Company, 1805 First Avenue, New York, has increased its capital stock from \$5,000 to \$10,000.

The United States Alloys, Inc., Buffalo, recently organized, has purchased a site of 16 acres on the River Road and the New York Central Railroad on which it will build an extensive plant for the production of alloys used in the manufacture of steel. The new plant adjoins plant No. 3 of the International Graphite Company, now under construction, and in the immediate vicinity of the steam-electric power plant of the Buffalo General Electric Company on the Buffalo River, now being completed, with a capacity of 100,000 hp.

The American Body Company, Buffalo, N. Y., is building a two-story brick addition to its factory at Niagara and Breckinridge streets.

The Commercial Electrolytic Corporation, Buffalo, has commenced construction of a two-story reinforced concrete factory at Colgate Avenue and the South Buffalo Railroad to cost \$25,000.

The Jacob Dold Packing Company, Buffalo, has purchased property, 90 x 500 ft., at Fillmore Avenue, William Street and the New York Central Railroad, on which it will build an addition, including a four-story office building. The additional site will also enable the company to increase its elevated railroad storing and shipping facilities to a total of 30 cars.

The Ferguson Steel & Iron Company, Buffalo, is further enlarging its steel fabricating plant at Bailey Avenue and the New York Central Railroad by the erection of a building to cost \$20,000.

The Barcalo Mfg. Company, Louisiana and Republic streets, Buffalo, is building a further addition to its plant for the manufacture of iron and brass beds.

The American Metal Bed Company, Newark, N. J., has filed plans for alterations and improvements in its plant on Clifton Street.

The Grimes Engineering Company, Hudson Street, Jersey

CITY, N. J., operating the Atlas Iron Company, is negotiating with the City Commission for property in the South-Cove section for the construction of a new drydock.

The Brunswick Motor Car Company, Maywood, N. J., has been incorporated with a capital of \$500,000 to manufacture automobiles, engines, etc. Alden V. Meeks, Maywood; James T. Bunt, Norwood; and Russell Smith, New York, are the incorporators.

The Newark Tube & Metal Works, 560 Ferry Street, Newark, N. J., has taken out a permit to make alterations and improvements in its plant.

The Kent Motors Corporation, 1790 Broadway, New York City, recently incorporated, has increased its capital stock from \$100,000 to \$2,000,000, to provide for the erection of its proposed automobile manufacturing plant on property acquired on Washington Avenue, Belleville, N. J.

## New England

BOSTON, MASS., Nov. 6, 1916.

Embargoes are once more beginning to be a part of the daily news of New England. The Boston & Albany Railroad has placed an embargo, with the usual exceptions, on freight originating in Albany or further west destined to points on the New Haven lines. This has not been heavily felt yet, but indicates the increase in pressure upon the transportation lines. The shortage of coal is beginning to assume serious aspects in some localities and prices are sky-rocketing according to reports in every district.

The North & Judd Mfg. Company, New Britain, Conn., has increased its capital stock from \$1,000,000 to \$1,250,000.

The Scovill Mfg. Company, Waterbury, Conn., has secured permits to build a factory on Silver Street, 125 x 220 ft., one story, and another factory building on the same street, 50 x 170 ft., one story.

The Waterbury Mfg. Company, Waterbury, Conn., has awarded a contract for a six-story building, 62 x 147 ft., and 62 x 142 ft., to the Aberthaw Construction Company.

The Chase Metal Works, Waterbury, Conn., has secured a permit to erect a storehouse on Thomaston Avenue, 62 x 200 ft., one story.

The United Aluminum & Smelting Company, New Haven, Conn., has bought a tract of land in North Haven and will erect there five buildings, the largest 100 x 200 ft., one story. The new plant will be used for smelting aluminum, and it is expected to be ready by Jan. 1.

The New Haven Malleable Iron Company, New Haven, Conn., is contemplating an addition, 75 x 300 ft., to be constructed early in the spring.

The Standard Mfg. Company, Bridgeport, Conn., has increased its capital stock from \$75,000 to \$500,000.

The J. O. Smith Mfg. Company, Middletown, Conn., has awarded a contract for an addition to its plant in Westfield, 26 x 52 ft., three stories.

The Bridgeport Steel Company, Stratford, Conn., has been incorporated with capital stock of \$100,000 to deal in steel and iron. The incorporators are Clarence R. Hall, Stratford; John T. L. Hubbard, Fairfield, and Mabelle K. Pederson, Bridgeport.

The Capitol File Company, Hartford, Conn., has been incorporated with capital stock of \$50,000 to manufacture files, tools, etc. The incorporators are Matthew F. Moskey, Benjamin J. Moskey, Stephen Moskey, Theodore E. Clark and Stanislaw Wisniewski.

The Rockwell-Drake Company, Plainville, Conn., has increased its capital stock from \$300,000 to \$350,000.

The United Metal Company, Norwich, Conn., is to build an addition, 30 x 60 ft., one story.

The Terry Steam Turbine Company, Hartford, Conn., is adding one story to its office building.

The Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., is to build a factory on Bank and Meadow streets, 40 x 180 ft., two stories, and 35 x 150 ft., one story. Traveling cranes will be installed.

The A. H. Wells Company, Waterbury, Conn., is having plans drawn for a power house, 45 x 50 ft., to be erected at its new plant on East Aurora Street.

The Chase Rolling Mill Company, Waterbury, Conn., is to build an addition to its storehouse on East Farm Street, 63 x 32 ft.

The Rider Bagg Company, Springfield, Mass., has awarded a contract for an addition, 30 x 56 ft., one story, to its foundry.

The Stanley Steel Wheel Company, Portland, Me., has been incorporated with capital stock of \$750,000. The officers are Eugene L. Bodge, president, and Scott Wilson, treasurer and clerk.

The Reed-Prentice Company, Worcester, Mass., is building an addition, 55 x 58 ft., one story, at its Gold Street plant for storage purposes.

The General Electric Company, West Lynn, Mass., is reported to be contemplating the erection of a steel foundry, 10 x 190 ft., one story, and a manufacturing building, 60 x 310 ft. It has also been receiving bids for a pattern shop at its Everett, Mass., plant, 115 x 200 ft., one story.

The New England Drawn Steel Company, Mansfield, Mass., expects to occupy a new factory in about four months.

The Washburn & Garfield Mfg. Company, Worcester, Mass., is to build a factory, 61 x 99 ft., three stories.

The New York Smelting & Refining Company, Bridgeport, Conn., has been incorporated with capital stock of \$100,000. Abraham Rachelson is president; I. Kaspedon, treasurer, and Philip Norvitz, secretary.

The Mansfield Foundry Company, manufacturer of gray-iron castings, Mansfield, Mass., recently incorporated, has a capital stock of \$15,000, not \$150,000 as stated in THE IRON AGE of Oct. 12, 1916.

## Philadelphia

PHILADELPHIA, PA., Nov. 6, 1916.

The Hamburg Boiler Works, maker of pneumatic and storage tanks and air receivers, Hamburg, Pa., requires a good second-hand belt-driven angle bending roll with a capacity of 4 in. x 4 in. x 1/2 in. angles. The company is extending its side track 170 ft. and extending its main shop 50 ft. and will require a 4-ft. drill press and set plate bending rolls later on. Henry A. Seiders is proprietor.

The Kutztown Foundry & Machine Company, 1421 Chestnut Street, Philadelphia, has altered its power system to provide for the operation of 45 motor-driven units of from 3 to 45 hp. The company is now shipping two carloads of castings per week to Japan.

The Economy Refrigerating Company, Philadelphia, has been incorporated with a capital of \$25,000 to manufacture refrigerating machinery. A. C. Middleton, Philadelphia, is president.

Smith, Drum & Co., Philadelphia, will build an addition to their machine shop on Allegheny Avenue.

John H. Ferguson, 3855 North Nineteenth Street, Philadelphia, will build a new one-story brick machine shop, 36 x 150 ft., on Broad Street.

The Philadelphia Enameling Mfg. Company, Philadelphia, has awarded a contract to C. H. Swartz for the erection of a new one-story plant, 120 x 200 ft., on Eighty-second Street, at a cost of \$12,000.

The Midvale Steel Company, Nicetown, Pa., has awarded a contract to Barclay, White & Co., for the erection of an addition to its machine shop, about 75 x 155 ft., on Wissahickon Avenue, at a cost of \$40,000. The company will also build a one-story addition to its press plant.

The Joseph Stokes Rubber Company, Trenton, N. J., manufacturer of hard rubber goods, will build two additions to its plant on Taylor Street, comprising one and two-story structures.

The Anchor Pottery Company, Trenton, N. J., manufacturer of general pottery ware, will build a one-story brick addition to its plant on New York Avenue.

The Luzerne Rubber Company, Trenton, N. J., manufacturer of hard rubber specialties, will build a two-story factory on Mulrhead Avenue, to cost about \$10,000.

The Doyle-DaCosta Mfg. Company, Trenton, N. J., has been incorporated in Pennsylvania with a capital of \$50,000 to manufacture insulated wire. A plant will be established at Easton, Pa. William L. Doyle and Robert C. DaCosta, Trenton, are incorporators.

Heister A. Bowers, Reading, Pa., and associates, will establish a plant for the manufacture of adding machines. A company with capital of \$200,000 has been organized.

The United States Radium Works, Sellersville, Pa., is making improvements and additions in its plant and will increase the capacity.

The Lehigh Valley Railroad is considering the erection of new machine shops and roundhouse at Hazelton, Pa. It is reported that \$200,000 has been appropriated for the purchase of machinery and equipment. The company is also planning for the installation of new equipment at its roundhouse at Delano, Pa.

The Metal Products Company, Lancaster, Pa., will increase the capacity of its plant.

The Gross Mfg. Company, West Hazelton, Pa., will build an addition to its brass molding plant.

The Benjamin Iron & Steel Company, Hazelton, Pa., will install equipment at its plant at Hazelton Heights for the manufacture of coal-mining machinery, steam shovels, etc.



The Baltimore Peach Bottom Slate Corporation, manufacturers of roofing and structural slate, Delta, Pa., not the Peach Bottom Slate Company of Delta, Pa., was organized recently, as reported in THE IRON AGE of Sept. 28. C. R. Gray, the president, is son of the president of the Western Maryland Railway Company, who is a director.

## Pittsburgh

PITTSBURGH, PA., Nov. 6, 1916.

Conditions in the iron and wood-working machinery trades, and also in heavy machinery for iron and steel plants in this district continue remarkably active, and very high prices are being paid for second-hand tools of all kinds that are in good repair and in condition to be operated. The large companies here that build heavy rolling mill and steel works machinery, such as the United Engineering & Foundry Company, Mackintosh, Hemphill & Co., the A. Garrison Foundry Company, the Lewis Foundry & Machine Company, the Mesta Machine Company and others, all report they have very much more work on their books than ever before, and that on many desirable inquiries they are compelled to refuse to quote, not being able to make the deliveries wanted. One leading manufacturer who makes a specialty of iron and steel works equipment has lately refused to quote on any inquiries, stating the entire capacity of all its plants is sold up for the next 15 to 18 months. Other companies cannot quote on new business for delivery inside of 9 to 12 months, and in some cases are quoting what they know are prohibitive prices, as they cannot possibly furnish material within the time wanted by the customer.

Machinists, brass finishers and other labor employed by large shops are hard to find and for months the Westinghouse Electric & Mfg. Company, Westinghouse Machine Company and others have been advertising for hands. It is said that on a recent inquiry for a large blooming mill, two or three builders refused to quote and one made a price of 15c. per lb. erected, an unheard of figure for such equipment. A large demand exists for 8, 9 and 10-in. mills. Prospective buyers are willing to take second-hand mills if in good condition, but are unable to find them. One leading electric steel company just outside of Pittsburgh is in the market for a 10-in. mill, and willing to pay almost any price to get it, but so far has not obtained it.

Recently the National Tube Company sent out a large list of tools needed for extensions it is making to its works at Lorain, Ohio. This list has just been supplemented by another for tools for its works at Ellwood City, Pa., including, one 36-in. planing machine, one 24 x 16 ft. lathe, two 20 x 10 ft. lathes, one 30-in. vertical drill press, one horizontal centering machine and one 2 x 24-in. turret lathe. The company has been a heavy buyer of machine-tool equipment for some months and will likely need additional tools for extensions now being planned.

The Pittsburgh & Lake Erie Railroad, whose large pattern department in its McKees Rocks shops in the Pittsburgh district was destroyed by fire recently, has bought in the last two or three weeks some 25 or more wood-working tools to replace those destroyed by fire. A good part of the equipment was placed through the Pittsburgh office of Manning, Maxwell & Moore, Inc.

The Trumbull Steel Company, which will build a new open-hearth steel plant at Warren, Ohio, is in the market for a 42-in. lathe and a 5-ft. radial drill.

## Baltimore

BALTIMORE, MD., Nov. 6, 1916.

At a cost of about \$500,000 the Bethlehem Steel Company, Sparrows Point, Md., will have a gas-driven electric generator house and a gas-driven blowing-engine house constructed.

Samler Brothers, Inc., East Falls Avenue and Stiles Street, Baltimore, has been incorporated with \$10,000 capital stock to deal in machinery, rails, cars, boats, motors, etc. The incorporators are James W. Hill and William and Benjamin Samler.

George W. and John F. Deal, 1516 North Regester Street, Baltimore, plan the construction of a three-story factory for the manufacture of iron and wire goods.

The Atlantic Iron Works, Norfolk, Va., has been incorporated by C. A. Marwitz, Jr., secretary, and others, with \$25,000 capital stock.

E. P. Seifert, Richmond, Va., is understood to be interested in the construction of an iron foundry.

The Rogers & Madison Truck Corporation, Petersburg, Va., is planning the construction of factory building to cost \$15,000.

## Chicago

CHICAGO, ILL., Nov. 5, 1916.

The Russian Government is still buying special lathes, not in large single orders but in scattered lots where the best deliveries are obtainable. Inquiry for some heavy pattern lathes for munition work is still active. That which has the greatest significance in the situation from the standpoint of business to come following the war is the apparent policy of the general manufacturing trade. As has been noted, a fair volume of orders for general purpose tools is being received from manufacturers in staple lines, consisting of from one to a half dozen machines. The equipment being purchased is but a fraction of what the trade needs and because of prohibitive prices many purchases are not being made but postponed. If, as is now generally expected, a period of good business will follow the war, upon the basis of an adjusted level of prices, this demand for machine tools will not be the least part of it.

The Ghent Motor Company, 20 East Jackson Boulevard, Chicago, advises that it will be in the market for equipment for the manufacture of radiators and sheet metal parts for its cars and also equipment suitable for the manufacture of both front and rear axles.

The Great Northern Railway Company is planning for the electrification of more than 300 miles of its main line between Spokane and Seattle, Wash. The project includes raising the level of Lake Chelan, near which a main power plant will be established. It will be some time before the company is in the market for any material.

C. R. Bronson, 305 North Menard Avenue, Chicago, will build a one-story factory, 58 x 90 ft., to cost \$4,000.

The city of Chicago, Charles W. Kallal, architect, is about to erect a power plant for which an expenditure of \$120,000 is estimated.

The Crane Company, Chicago, has awarded contracts for the erection of a two-story machine shop, 80 x 220 ft., to cost \$65,000.

F. Bromer, through the Thomas G. Gage Company, general contractor, will erect a one-story shop to cost \$5,000. It will be 50 x 65 ft.

The Chicago Hardware Foundry Company, North Chicago, Ill., will add an additional foundry unit 105 x 135 ft. to its plant. Part of this will be used as a machine shop.

The Pechstein Iron Works, Keokuk, Iowa, advises that it will complete a new foundry, pattern shop and office building this fall, costing \$20,000 to \$25,000, and that in the spring its machine shop will be enlarged and additional equipment installed.

The American Fork & Hoe Company, Fort Madison, Iowa, is constructing a new plant consisting of six buildings. Consideration is now being given to the purchase of elevators, while the buying of machinery will come a little later.

## Milwaukee

MILWAUKEE, WIS., Nov. 6, 1916.

Industrial expansion, particularly that which furnishes the bulk of the demand upon machine tool builders, is being carried on in ever-increasing volume, and opinion appears to be that if they were in a position to make deliveries more promptly, shop extension work would assume a much larger aspect. The willingness of metal-working shops to continue to enlarge facilities in the face of the high cost of building materials and equipment, is taken as due proof of confidence in the future. The Milwaukee tool business has been confined almost exclusively to domestic requirements for a good many months, and export business really has been accepted as a favor, so that the rise or fall of European demand is an insignificant factor. There is hardly a line of industrial effort that is not sharing in the general wave of good feeling and full occupation. It is noted that the labor situation, which long ago became acute in the metal-working industry, is assuming a like condition in practically every other line of manufacture, notably in lumbering, which up to eight or ten months ago was still suffering from stagnation. Manufacturers of logging, lumbering, sawmill and other wood-working equipment say that they have never before known of a better or larger demand for their products as at present.

The Koehring Machine Company, Thirty-first Street and Concordia Avenue, Milwaukee, manufacturing power concrete mixers and pavers, is enlarging its plant by the erection of an addition to its main shop, 54 x 118 ft.

The Rotary Gas Engine & Pulverizer Company, Antigo, Wis., recently organized to manufacture power farm machinery, has contracted with Mayer Brothers, Antigo, founders and machinists, for the complete manufacture of its machines for the present.

Joseph Zicka, founder and machinist, Algoma, Wis., has purchased the factory which he has occupied for several years, together with additional acreage, and will remodel and enlarge the plant.

The Allis-Chalmers Mfg. Company, Milwaukee, is building a garage service station and small repair shop for the convenience of employees at its main works in West Allis. It will be 60 x 120 ft., and adjoin the company's club house.

The Overland-Madison Company, Madison, Wis., has been granted a permit to build a garage, warehouse and service building at East Wilson and King streets, to cost \$50,000.

The Thomas Machine Shop, New London, Wis., is now building fire escapes, and its plant probably will be enlarged to accommodate this department.

The Dornfeld Iron Works, Watertown, Wis., which have been producing farm tractors in conjunction with the Brillion Iron Works, Brillion, Wis., for eight months or more, have been taken over by the Monarch Tractor Company of Chicago, a \$250,000 corporation. The chief product will be a tractor, in 6 x 50-hp. capacities, for which orders aggregating more than \$400,000 are said to be already booked. The manufacture of sugar cane harvesting machines will also be conducted on a large scale on contracts with the Luce Sugar Cane Harvester Company of New Orleans. The force of workmen in the Dornfeld works will be increased.

The Automatic Cradle Mfg. Company, Stevens Point, Wis., expects to take occupancy of its new plant at Portage and North Third streets, Dec. 15. At that time the present plant will be released for the tire protector manufacturing business conducted by J. J. Buckolt, general manager of the company, and the output of steel-shod protectors increased to 200 pairs daily. The Automatic Company is already making preliminary plans for further extensions, to consist of a four-story brick structure, 80 x 200 ft., which may be erected next spring.

The Lake Superior Electric Company, Superior, Wis., is now settled in its new plant at Third Street and Grand Avenue, and is increasing its output of electric operating compresses, steering gear units and other electrically operated marine devices. The design is by M. B. Benson, president and chief engineer.

The Wisconsin Wire Works, Appleton, Wis., specializing in screens and looms for paper mill machinery, is building a factory and stock room addition, 30 x 150 ft.

The Chicago & Northwestern Railroad Company, which is building a frame ore dock, known as No. 3, at Ashland, Wis., is reported to be contemplating the construction of a fourth dock, of reinforced concrete and steel.

The Burnell Fuel Saver Company, Milwaukee, has been incorporated with a capital stock of \$10,000 to manufacture automobile carburetion appliances. The incorporators are Albert A. Giese, Alfred J. Melms and Max J. Elsner.

The Anger Engineering Company, 301-303 Sixteenth Street, Milwaukee, specializing in custom built automobiles, etc., will build a larger plant at once at Twenty-sixth and State streets. Klug & Smith, consulting engineers, Mack Block, Milwaukee, are preparing plans for a one-story structure, 120 x 130 ft. B. F. Anger is general manager.

The Electric Steel Castings Company, Milwaukee, is making progress in the erection of its foundry in West Allis. It is now hoped to start operations April 1, 1917. Leo G. Smith is president and general manager.

The Northern Furniture Company, Sheboygan, Wis., has been purchased for approximately \$500,000 by Jacob L. Reiss, New York, and Edward Hammett and August Westermeyer, Sheboygan, from Gustave Huette, who will devote his entire attention to the management of the Falls Motors Corporation, Sheboygan Falls, Wis. Mr. Reiss is the eldest of the Reiss brothers, Sheboygan, coal, dock and Great Lakes steamship operators.

The A. O. Smith Company, Milwaukee, maker of pressed steel products and motor trucks, has increased its capital stock from \$1,000,000 to \$3,000,000, with an additional issue of 100,000 shares without par value, to accommodate the increase in its business, which has grown from a volume of \$500,000 in 1905 and \$2,000,000 in 1910, to more than \$7,000,000 in 1916. Considerable new equipment is being installed in the main works at Twenty-seventh and Hopkins streets and the old works at Park and Clinton streets, abandoned in 1909, will be transformed from a warehouse into a branch works to handle the overflow. The new equipment includes a 2000-ton press, said to be the largest ever built, which does the work of four ordinary presses for producing steel frames for automobiles and motor trucks. L. Raymond Smith, who succeeded his father, Arthur O. Smith, as president and general manager upon his death in 1912, continues to hold the chief interest and the active management of the business.

## Detroit

DETROIT, MICH., Nov. 6, 1916.

With the month of October one of the best in the history of the machinery trade, indications are that November will set a new record. Milling and grinding machines are especially in demand, although delivery is not promised for months. Small lot orders are coming in, but the total is unusually large.

The Commercial Body Company, Bay City, Mich., has been organized by W. B. Fitzgerald, Henry Kinney, Robert Woodsworth, A. E. Hubbell and others, to develop an automobile body business. A factory will be erected at once.

The G. H. Wood Paper Company will build a factory and warehouse at Monroe, Mich., in the spring. Much new machinery will be installed.

The Howell Electric Motors Company, Howell, Mich., has increased its capital stock from \$30,000 to \$100,000, and plans an addition to its factory, 40 x 100 ft. New machinery will be installed which will double the output of the plant.

The Buhl Stamping Company, Detroit, which recently sold its plant to the Pennsylvania Railroad for \$840,000, is preparing plans for a factory on seven acres of land on Scotter Avenue which will have 150,000 sq. ft. of floor space. Lawrence D. Buhl is president.

The Porcelain Insulator Company, Hastings, Mich., recently incorporated for \$25,000, will open its factory for the manufacture of all kinds of porcelain insulators within a few weeks. Machinery and a large kiln will be installed.

The Standard Machine Company, Owosso, Mich., is selling stock to secure money to erect a modern plant. The plan of the company, of which E. W. Brown is secretary and treasurer, is to build a two-story machine shop, 40 x 120 ft., and a foundry 50 x 80 ft.

The Original Mfg. Company, Greenville, Mich., has leased a plant for the manufacture of toys. L. B. Hart is the organizer.

Production of 200 universal joints per day will be started shortly by the Michigan Wheel Company, Grand Rapids. New equipment will be added.

The Kalamazoo Sanitary Mfg. Company, Kalamazoo, Mich., capitalized for \$350,000, will immediately begin the erection of a plant to turn out porcelain bowls and tanks, and plumbers' supplies.

The Swan Mfg. Company, Port Huron, Mich., will shortly place on the market an air motor and air compressor. William Swan is president.

John L. Cook, recently elected president of the Walker Mfg. Company, Fenton, Mich., will open a foundry at Fenton and has secured orders from several Flint factories.

The Hayes Wheel Company, Jackson, Mich., has increased its capital stock from \$1,000,000 to \$1,500,000, and is preparing to manufacture wire wheels in addition to its present output of 1,000,000 sets a year. C. B. Hayes is president and general manager.

The Duplex Power Car Company, Charlotte, Mich., is planning to increase its output. Leroy H. Brown is manager.

G. Moeke & Sons, Zeeland, Mich., whose planing mill was damaged by fire recently, are in the market for 20-hp., 7½-hp. and 1-hp. motors and a three-drum sander and blower system.

## Cleveland

CLEVELAND, OHIO, Nov. 6, 1916.

A steady demand is coming from manufacturing plants for small lots of machine tools. While early shipment is wanted in most cases, orders have been placed for the best deliveries that can be secured. Shipments on some standard lathes and milling machines have eased up somewhat. One leading builder of milling machines, however, is taking orders for delivery next September. The supply of second hand machinery appears to be somewhat more plentiful than for some time. Some northern Ohio plants are inconvenienced by the soft coal shortage but none is reported to have been compelled to shut down for lack of fuel. The natural gas supply was cut off from the large consumers in this section last week, the gas companies wishing to conserve their supply for domestic purposes. Manufacturers were notified several months ago of the contemplated action and had ample time to arrange for other fuel supplies.

The Republic Structural Iron Works Company, Cleveland, has purchased the plant of the Avery Company, Lakeside Avenue and Fifty-third Street, covering 100,000 sq. ft. of floor space. This will be remodeled and equipment will be installed for handling and fabricating steel bars for reinforced concrete work. Large storage facilities will be provided so that a contractor can place an order for reinforcing



steel for a complete building and after this is fabricated it can be kept in storage and sent to the job as needed.

The Abbott Corporation, Cleveland, will shortly begin the erection of its new automobile plant on East 152d Street. The first building to be erected will be 110 x 680 ft.

The Standard Signal Tail Light Company, Cleveland, has been incorporated with a capital stock of \$50,000 by A. A. Stambaugh, S. C. Ellitt and others to manufacture vehicle signals.

The American Steel & Wire Company, Cleveland, will erect an addition to its American works, to enlarge the capacity of its fine wire department, at a cost of \$75,000.

The Cleveland Steel Valve Company, Garfield Building, Cleveland, will establish a plant in Dover, Ohio, in addition to the plant it now occupies in Kent, Ohio.

The Chatelain Machine Company, Akron, Ohio, has been incorporated with a capital stock of \$75,000 by Alexander Chatelain and others and, it is announced, will build a machine shop next spring.

Paul Maiwurm is heading a company that will establish a plant in Ashland, Ohio, for the manufacture of aluminum ingots and die castings. It is stated that an aluminum foundry 40 x 160 ft. will be erected.

The Dall Motor Parts Company, Vermillion, Ohio, has been organized and will erect a building, 40 x 83 ft., to manufacture pistons and other automobile parts. W. E. Derr is president and L. A. Dall, general manager.

The Trumbull Mazda Lamp Division of the General Electric Company, Warren, Ohio, will build an addition 60 x 144 ft., three stories and basement.

It is announced that the Westgard Tire & Rubber Company, Warren, Ohio, will shortly begin the erection of the first unit of its new plant which will be 100 x 240 ft., two stories and basement, and a power plant. W. C. Owen & Co., Cleveland, are the engineers.

The Foster Bolt & Nut Mfg. Company, Cleveland, is erecting a new two-story brick addition which will about double the present floor space of the company.

The Sidney Tool Company, manufacturer of wood-working machinery, Sidney, Ohio, is constructing a two-story brick addition, 60 x 100 ft., to be devoted entirely to the use of an erecting shop for its machine-tool department.

The Bell Mfg. Company, Fairmount, Ind., has taken a munitions contract for the United States and is erecting an addition to its plant.

The Peru Auto Parts Mfg. Company, Peru, Ind., has increased its capital stock from \$200,000 to \$300,000.

E. V. Brigham, general manager of the Union Sanitary Mfg. Company, Noblesville, Ind., has been elected vice-president of the newly organized Kalamazoo Sanitary Mfg. Company, Kalamazoo, Mich., manufacturer of enamel and earthenware, and Rolla Evans, also of the Union Company, has been appointed secretary.

The F. & M. Mfg. Company, Cambridge City, Ind., has been incorporated with \$25,000 capital stock, to manufacture woodenware. The directors are P. E. Fisher, V. E. Martindale and G. W. Fisher.

The Sefton Mfg. Company, Anderson, Ind., manufacturer of paper boxes, etc., has been sold to Edwin J. Nergard, Chicago, for \$3,000,000. The company has two other plants, one at Chicago and the other at Brooklyn, N. Y.

The Marion Metal Products Company, Marion, Ind., has been incorporated with \$50,000 capital stock, to manufacture automobile accessories. The directors are W. E. Plummer, G. A. H. Shideler, C. A. Williams, Gus C. Condo and John R. Browne.

Fire recently damaged the auto parts factory of G. W. Millikan, Muncie, Ind., to the amount of about \$20,000. It will be rebuilt.

The Beuscher Band Instrument Company, Elkhart, Ind., has been sold to C. D. Greenleaf, W. H. Foster and J. A. Bell. The transaction involves a consideration of \$175,000.

The Metal Auto Parts Company, Connersville, Ind., has increased its capital stock from \$50,000 to \$150,000.

The Quality Broom Company, Evansville, Ind., has been incorporated with \$5,000 capital stock, to manufacture brooms. The directors are S. Cunningham, Dr. Jeremiah Jackson and S. Chapman.

The Thread Mills Company, Monticello, Ind., is planning an extension to its plant, to cost \$40,000.

The Wheat Paper Company, Elkhart, Ind., will resume operations in its plant at Petoskey, Mich., which was recently burned. For a time the production will be limited to pulp. New fire proof buildings will be erected and new machinery installed.

## Indianapolis

INDIANAPOLIS, IND., Nov. 6, 1916.

The newly-organized National Motor Car & Vehicle Corporation of New York will take over the National Motor Vehicle Company, Indianapolis, and will enlarge the plant in addition to a three-story reinforced concrete building 60 x 380 ft. now in course of erection. Property has been purchased for the other additions, the main building of which will be 140 x 328 ft. These improvements will increase the capacity of the plant to 6000 cars a year. The new corporation at present is only a holding company for the entire capital stock, but it will eventually take over the company as a going concern. A. C. Newby, president; W. G. Wall, vice-president, and George H. Dickson, secretary-treasurer, all identified with the company since its establishment in 1900, will hold similar positions with the new corporation.

The J. C. Vaughn Mfg. Company, Indianapolis, has been incorporated with \$10,000 capital stock, to manufacture whiffletree hooks and clips. The directors are James C. Vaughn, William F. Reynolds and W. A. Vaughn.

The Kramm Foundry Company, Indianapolis, has been incorporated with \$50,000 capital stock. The directors are Harry D. Kramm, W. S. Wilson and Charles B. Hauk.

The Fletcher Savings and Trust Company has been appointed receiver for the Indianapolis Foundry Company. It is stated the company is not insolvent, having assets of \$298,670 and liabilities of \$164,362, but it suffered in the flood of 1913 and from a three months' strike this year and lacks working capital.

The Kilo Electric Meter Company, Indianapolis, has been incorporated, with \$40,000 capital stock, to manufacture electrical appliances. The directors are Claude L. Marshall, Gustave A. Schaffer and William T. Wann.

The Richmond Malleable Iron Foundry Company, Richmond, Ind., has been organized, with \$100,000 capital stock, with John M. Lontz as president and Harry Lontz, secretary-treasurer. Mr. Lontz is president of the F. & N. Lawn Mower Company, Richmond. One of the buildings formerly occupied by the M. Rumely Company will be taken over and work on another unit near the F. & N. plant has been begun.

The Wabash Valley Electric Company, Clinton, Ind., has been incorporated with \$250,000 capital stock, to supply electricity for light and power. The directors are H. C. Dies, J. W. Robb and M. V. Robb.

## Cincinnati

CINCINNATI, OHIO, Nov. 6, 1916.

Quite a number of orders for portable electric drilling machines have lately been received for export to Spain. Spanish importers have also bought more machine tools than at any previous period. Some fair-sized shipments are also scheduled to go to Italy. Canadian business is slowing down somewhat, but a number of single tools are in demand from munition makers in that country.

The domestic demand for machine tools is keeping up well, and it is stated on good authority that the present year will witness the largest volume of business ever booked by local and nearby machinery manufacturers. A somewhat disconcerting feature is the high cost of material and labor. The foundries are practically operating to full capacity and the threatened car shortage has not inconvenienced any of them so far as a supply of coke and pig iron is concerned. Wood-working machinery is in better demand. Boiler and tank makers are very busy. Electric generators and motors are also in good demand, but the smaller units are being sold.

Work on the new plant of the R. K. Le Blond Machine Tool Company, Hyde Park, Cincinnati, is progressing rapidly, and the buildings will be ready for installation of the necessary equipment early in the spring. No information has been given out as to the disposition of the company's plant in East End.

Considerable local interest is taken in the reports that an industrial center will be established at Winton Place. The only firm that has officially announced its intention of building a plant there is the Champion Tool Works Company, now located on Spring Grove Avenue, Cincinnati. No plans have yet been made up for the new plant.

The Collin Gardner Paper Company, Middletown, Ohio, has commenced work on a new power plant addition estimated to cost \$200,000. Most of the equipment has been provided for.

The Dayton Screw Company, Dayton, Ohio, whose plans were previously mentioned, will have its new plant in full operation before Dec. 1.

The Ohio State University, Columbus, Ohio, will make application to the State Legislature for an appropriation of \$200,000 to be used for building a new power plant for which plans have been prepared.

The Corrugated Container Corporation, Columbus, Ohio, is reported contemplating adding special equipment for increasing the capacity of its plant. Details are not yet available.

The C. A. S. Products Company, Columbus, Ohio, maker of automobile gears and other specialties, has recently received some large orders that will require increasing its manufacturing equipment.

The Sidney Mfg. Company, Sidney, Ohio, has commenced work on two additions to its plant, 45 x 100 ft., four stories, mill construction.

The Marietta Mantel Company, Marietta, Ohio, is contemplating the erection of a new plant. Details are lacking at this time.

The Pioneer Window Glass Company, Marietta, Ohio, will soon be incorporated to erect a glass plant at that point. Information may be obtained from the Marietta Chamber of Commerce.

## Birmingham

BIRMINGHAM, ALA., Nov. 6, 1916.

Wholesale machinery dealers fully share the prosperity in other industrial lines. The rush for hydroelectric and other apparatus in the Alabama graphite field is a leading feature, owing to the rapid succession of new companies undertaking operations. Every line is reported as active. Deliveries alone are cause for worry.

The Smet-Solvay Company has purchased 7300 acres in Tuscaloosa County near the Yolande Company coal mines of the Alabama Company for \$500,000. By-product plants are said to be contemplated. The company already has plants at Ensley and Holt, Ala.

L. J. Bugg, Monroeville, Ala., and others, are figuring on establishing a hydroelectric power plant for several towns, at a cost of \$40,000.

The Atlantic Paper & Pulp Company, Savannah, Ga., will establish a paper pulp mill of 50 tons per day capacity. I. H. Fetty, president of Savannah River Lumber Company, is president. The company is capitalized at \$1,000,000.

The Pasco Tool Company, Atlanta, Ga., has opened a tool store at 56 North Broad Street and will not manufacture small tools, as has been stated.

## The Central South

LOUISVILLE, KY., Nov. 6, 1916.

Something of a lull is reported for the week, ascribed to the car, coal and labor shortages. Both buyers, manufacturers and dealers seemed to be holding up action. A more critical situation than had been expected was uncovered at the beginning of the inquiry into the car shortage at Louisville last Friday. Numerous industrial plants are on the verge of suspension for lack of coal. Metal-working concerns, especially copper working plants, are taking rather extensive orders from distillers in preparation for resumption of operation, which has been delayed because of increased costs of grain.

The Visible Measure Gasoline Dispenser Company, Louisville, Ky., has increased its capital stock from \$40,000 to \$50,000.

Louis Coe, Jeffersontown, Ky., is building a concrete garage at Jeffersontown, 50 x 100 ft.

The Mowbray & Robinson Company, Cincinnati, Ohio, holding 60,000 acres of timber properties in Clay, Leslie, Knott and Perry counties, Ky., has executed a mortgage for \$1,000,000 and will develop its holdings.

The Owensboro Ditcher & Grader Company, Owensboro, Ky., has booked an order for shipment of sixteen carloads of its machines, or a total of 1630 units.

The Columbian Iron Works, Chattanooga, Tenn., is completing a contract for 6-in. forged shells for the British Army, and begins at once the execution of a second contract said to total \$2,000,000.

The Chickasaw Cooperage Company, Memphis, Tenn., will rebuild its plant destroyed by fire at a loss of \$300,000. A complete cooperage equipment will be required. Walker L. Wellford is secretary and treasurer. The machinery destroyed included power machinery, four sets of barrel machinery, 10 sets of stave jointers, 15 sets of heading jointers and one set of pail and tub jointers.

St. Thomas Hospital, Nashville, Tenn., will erect a power house at a cost of \$22,000.

Charles E. Bower & Co., Memphis, Tenn., are asking for prices on a good second-hand 3-drum hoisting engine, 8 or 9 x 16 in., without boiler, for use with derrick with bull wheel.

The Standard Jellico Mining Company, Knoxville, Tenn., is asking for prices on air compressor and punchers, etc.

The John G. Duncan Company, Knoxville, Tenn., is asking for dealers' prices on a used air compressor, with capacity of 400 ft. of air per min.

## St. Louis

ST. LOUIS, MO., Nov. 6, 1916.

The demand for machine tools continues good and dealers are making contracts for far ahead delivery. One transaction closed the past week was for equipment for a new industry calling for delivery Jan. 1, 1918. Other late deliveries are reported on orders for new tools, which are being taken in a very satisfactory aggregate. Second-hand tools are not appearing in any quantity in this market. All buying is of the negotiatory type, rather than through sending out lists, it having become apparent that nothing could be gained by attempting to develop competition among dealers. The outlook for the remainder of the fall and winter as well as the early spring continues optimistic.

The Ever Tight Piston Ring Company, St. Louis, has increased its capital by \$47,500 in order to enlarge its manufacturing capacity.

The Newsom Valve Company, St. Louis, has been incorporated with a capital stock of \$250,000 by J. N. Newsom, A. J. Kessinger, A. F. Weber and A. B. Lewis to manufacture a patented tire valve.

The Barry Motor Company, St. Louis, Mo., has been incorporated with a capital stock of \$13,000 by C. J. and Frank X. Barry and C. L. Hyner to equip a garage and machine shop.

The Turner Tire Company, St. Louis, has been incorporated with a capital stock of \$13,000 by F. E. Turner, Muskogee, Okla., Charles Neimeyer, Little Rock, Ark., and N. W. McLeod, H. V. Stevens and S. T. G. Smith to manufacture vehicle tires.

The Sunshine Chemical Company, St. Louis, has been incorporated with a capital stock of \$10,000 by Henry C. Henley, D. H. Isch and Albert U. Johnson to do a general chemical manufacturing business.

The Bickell Construction Company, Kansas City, Mo., will equip a filter plant at Paris, Mo., to include two electrically driven centrifugal pumps. George C. Blakey, Paris, is superintendent of the plant.

E. J. Sweeney, Kansas City, Mo., 1112 East Fifteenth Street, will erect a large automobile school 85 x 116 ft., ten stories. Necessary equipment for practical education in all branches will be installed. The total cost is estimated at \$200,000.

An electric light plant will be built at Dumas, Ark., by the Improvement District No. 2, B. C. Bowles, secretary, at a cost of \$15,000. Bids will be received until Nov. 28. H. W. Wright, McGehee, Ark., is engineer.

The England Public Service Company, England, Ark., has been incorporated with a capital stock of \$100,000 by M. D. Goldsby, C. L. Emerson and R. L. Buffalo to equip an electric light and power plant.

The Arkansas Hydro-Electric Development Company, Little Rock, Ark., A. R. Amos, president, has bought the plant of the Heber Springs Light Company, Heber Springs, Ark., and will enlarge the plant and install new machinery.

The White Cliffs Lime Co., White Cliffs, Ark., has been incorporated with a capital stock of \$100,000, by F. B. Lane, W. Y. Foster and A. D. Dulaney, to secure an existing company, which will be enlarged and new machinery installed.

The Stout Lumber Company, Thornton, Ark., will rebuild its planing mills recently burned with a loss of \$100,000.

Sewer and Water District No. 1, Walnut Ridge, Ark., will modify its sewer and waterworks plans to provide for two pumping stations instead of one, the total cost to be about \$80,000. Herman Phillips, St. Louis, is engineer.

The Ottawa County Ice Company, Miami, Okla., is receiving bids to equip an ice plant of 800 tons and storage building. It will install two 60-hp. boilers and two 50-hp. Corliss engines and other machinery.

The Texas Company, Houston, Tex., will equip a branch plant at McAlester, Okla., requiring about \$7,000 worth of machinery.

Stroud, Okla., will improve its sewage plant and waterworks at a cost of about \$30,000.

The Oklahoma Prepay Fan Company, Oklahoma City, Okla., has been incorporated with a capital stock of \$30,000 by J. H. Collier, M. Blake and others to manufacture fans.

The cotton gin of L. G. Dean, Shaw, Miss., has been burned with a loss of \$40,000. The equipment will be replaced.

The Beaumont Hardwood Lumber Co., Beaumont, Miss., will erect a saw mill and wood-working plant with a daily capacity of 100,000 ft.



Coffeeville, Miss., is receiving bids on waterworks equipment, including pumping unit, etc.

The Hattiesburg Pulp & Paper Co., Hattiesburg, Miss., has been incorporated with a capital stock of \$1,500,000 by George R. Wright and G. H. Wood, Fort Dearborn Bank Building, Chicago, and others, and will equip a plant. Friend & Webbre, New Orleans, La., are engineers in charge.

The Dickinson Sales & Garage Co., Shreveport, La., will equip a machine shop, service station and garage to cost \$50,000.

The Union Petroleum Company, Westwego, La., will equip a can manufacturing plant with a capacity of 12,000 cans daily.

The Stern Foundry & Machinery Company, New Orleans, La., will erect and equip a foundry and machine shop, in addition to its present plant, to cost \$100,000.

## Texas

AUSTIN, TEX., Nov. 4, 1916.

The water power committee of the Manufacturers' Club of San Antonio is promoting the construction of a large hydroelectric plant to be located on either the Colorado, the Guadalupe or the Devil's River within convenient transmission distance of that city. A survey discloses that 100,000 h.p. of electrical energy could be disposed of in San Antonio.

The Guadalupe River Power Company, Gonzales, has finished construction of a dam across the Guadalupe River and will install a hydroelectric plant.

The El Paso Sash & Door Company, El Paso, will build a factory at a cost of \$100,000.

The Interlocking Cement Stave Silo Company, Waco, incorporated with a capital stock of \$40,000, will manufacture cement blocks for building silos. W. R. Anderson is a stockholder.

The Texarkana Ice Company has merged its ice plant at Texarkana into the ownership of similar plants at Paris, Corsicana, Tyler, Terrell, Big Springs and Nacogdoches, Texas; Sapulpa, Hartshorne and McAllister, Okla., and Vivian, La. C. W. Dawley of Dallas is manager of the consolidated interests. Improvements will be made to some of the plants.

The Gulf Refining Company has purchased 450 acres adjacent to its refinery at Port Arthur as a site for new terminals which it will build to meet the demands of its growing shipping interests. John W. Tyron is manager.

The Livingston Light & Power Company, Livingston, will install new machinery in its plant.

## San Francisco

SAN FRANCISCO, CAL., Oct. 31, 1916.

The situation as to deliveries in many lines of machine tools is becoming distinctly easier. The high prices still block a great deal of business, but with abundant indications that there will be no recession within the next year, buyers show gradually increasing confidence. Even the larger buyers, as a rule, are placing their orders singly, but a number of large groups of tools are being figured on. Many garages and small repair shops are being established, for which considerable machinery is required. Such shops are looking for second-hand tools, but such equipment of desirable character is getting hard to find. A moderate activity is noted in hydroelectric development, with several large projects being developed slowly. Motors are in good demand. The call for wood-working and logging machinery is increasing. Mining development in Nevada and Arizona is exceptionally active, and is giving rise to many important orders.

The Judson Mfg. Company, which is starting work on additions to its plants in Oakland and Emeryville, is preparing to change its power from steam to electricity.

The Atlas-Imperial Engine Company is building an addition to its plant in Oakland, 80 x 360 ft. A 40-ton crane 40-ft. span, will be purchased for the new shop, and the company is figuring on a large list of special tools. It has commenced the manufacture of true Diesel-type marine engines.

The Southern Pacific Railroad is preparing to build extensive yards on the bay shore south of San Francisco, including a roundhouse and small machine shop.

Owners of the Walker copper mine, near Portola, Cal., are planning to build a hydroelectric plant of about 1100 hp. capacity.

Plans and specifications will be ready shortly for the improvements to Machine Shop No. 1 at the Mare Island Navy Yard, Cal.

The C. L. Best Gas Traction Company, San Leandro, Cal., has just moved into its new plant. The old plant is now occupied entirely by the Best Steel Casting Company, which has added a new converter and a 10-ton crane.

## The Pacific Northwest

SEATTLE, Oct. 31, 1916.

Marine machine and repair plants in this section are experiencing a remarkably prosperous season. Some of the larger plants are running both night and day shifts. Repair work is especially brisk. The Doud-McFarlane Machinery Company, Tacoma, handling marine machinery, and manufacturer of gasoline pumps and logging machinery, has been working two shifts steadily for several months, and has not yet caught up with orders.

The car shortage in Oregon and Washington is steadily becoming more acute, and heavy losses have already been sustained in the handling of fruits and grains in the eastern part of these states. It is estimated that 10,000 cars are now short in the two states.

Reports covering 85 per cent of the lumber mill capacity of the Pacific Northwest show shipments of lumber 23 per cent below orders and orders exceeding production by 7.29 per cent, all co-incident with a horizontal advance of \$1 in prices on lumber, and also advances on shingles. Further tightening in car supply and increased severity in the shortage of cars to ship lumber is the assigned cause of the sudden change in lumber conditions. West coast mills are accepting only such part of the business offering as may be shipped in a reasonably short time, and are not loading up on contracts calling for delivery a month or two in advance. The advance of \$1 right through the lumber list has done much to improve the price values since May.

The Seattle Construction & Dry Dock Company, Seattle, has awarded to the McAteer Shipbuilding Company, Seattle, contract for the first four sections of the floating drydock it will build. Two sections will be added later, giving a total capacity of 20,000 tons. The work now under way will cost \$500,000. The machinery to equip the drydock will be built by the Seattle Construction & Dry Dock Company.

The Eugene Iron Works, Eugene, Ore., will erect a machinery room 40 x 68 ft.

The Anderson Steamboat & Shipbuilding Company, Seattle, has received contract for construction of two 8800-ton ships to be built for Hannevig Brothers of Norway. The contract was awarded by Capt. Louis Hannevig, recently in Seattle. The order means that a shipbuilding plant will be constructed on Lake Washington that will employ 1000 men.

The Oregon Shipbuilding Company, Portland, Ore., has been incorporated for \$500,000, and will establish a plant to construct steel steamships. It will be located near the Northwest Steel Company's plant. The company now has contracts for four 8800-ton steel freighters for Norwegian interests. The incorporators are Carlton E. Spencer, George E. Hobson and C. A. Sheppherd. The vessels contracted for will cost \$4,000,000.

William Cornfoot of the Albina Engine Works, Portland, Ore., who plans the establishment of a shipyard at his plant, has secured contract for two 3300-ton steel steamships.

Work has started on the sugar factory to be built in Missoula, Mont., at a cost of \$2,000,000, by Great Western Sugar Company. George B. Stone of the Dyer Construction Company, Salt Lake City, Utah, is in charge.

## Canada

TORONTO, Nov. 4, 1916.

Manufacturing in Canada in most lines continued active throughout the past month. Where any slackening of activity was noticeable it was due to lack of labor or delay in receipt of material. Metal-working establishments continue busy. The value of unfilled orders for the Canadian Car & Foundry Company is said to be about \$15,000,000. Steel-working companies the past two weeks did not give voice to complaints as to the supply of steel forgings and other parts to the same extent as in preceding weeks. It would appear that the additional equipment of foundries is now beginning to tell, and in future machine shops may have decidedly less cause for complaint. A readiness still exists among Canadian companies to complain of the prices obtained on government business, and the root of this is the difficulty in securing efficient mechanics. Slightly more men are offering now, but not of the class that has had the necessary training. The automobile industry here is also making big strides.

Many manufacturers and boards of trade throughout Canada and the United States visited the government exhibit of German and Austrian samples at Toronto. They came 300 a day to study the collection. Among the better grade articles displayed are small tools and hardware.

The erection of a plant at Hamilton, Ont., for the Hamilton Steel Wheel Company, to cost \$200,000, will start soon. Prack & Perrine, Lumsden Building, Toronto, are the architects.

The Canadian Aloxite Company, Niagara Falls, Ont., has commenced the erection of an addition to its plant at Montrose, Ont., of steel and concrete, to cost \$35,000. L. J. Call is engineer in charge.

The Perfection Tire & Motor Company, Ltd., 713 Marquette Building, Chicago, Ill., has secured a site and will erect a plant at Niagara Falls, Ont., estimated to cost \$150,000.

The Foundation Company, Montreal, is making preparations for the erection of the refinery at Port Colborne, Ont., for the International Nickel Corporation, at a cost of \$3,000,000. The company will put 800 men to work immediately on the reinforced concrete foundations. The labor situation is causing the company some concern. M. J. Barry, representative of the company at Toronto, stated that the company is paying 27½c. per hr. for common labor. The Foundation Company holds the contract for all construction work and does not sublet any portion.

The Saguenay Light & Power Company has commenced the erection of a power plant at St. Alexis, Que.

The Manitoba Pulp & Paper Company, Winnipeg, Man., will build a power plant at Grand Rapids, Man.

The Steel Furnishing Company, Ltd., New Glasgow, N. S., is in the market for three turret lathes, suitable for steel sockets and three millers suitable for milling outside thread of sockets.

The British America Nickel Company is making preparations for the erection of a refinery, probably in the Welland, Ont., district. The company has secured E. P. Matheson as general manager. E. R. Wood and James P. Dunn, London, Ont., are stockholders in the company.

The Perfect Machinery Company, Galt, Ont., has commenced the erection of a foundry. It will be ell-shape, 24 x 40 ft., and 20 x 26 ft., of concrete and brick.

John A. Campbell, Leamington, Ont., is in the market for a 50 to 100-hp. gas engine.

The Gold Lion Brewery at Valleyfield, Que., was practically destroyed Nov. 1 by fire starting in the engine room. The loss will amount to approximately \$150,000.

The John Hillock & Co., Ltd., 154 George Street, Toronto, manufacturer of refrigerators, etc., is in the market for a jointer.

G. A. Black, 359 Davenport Road, Toronto, is in the market for a 35 to 50-hp. fuel oil engine.

The British Munition Company, Verdun, Que., has let the contract to the Atlas Construction Company, 37 Belmont Street, Montreal, for the erection of an addition to its plant.

The Toronto Laundry Machine Company, Dundas Street and Sorauren Avenue, Toronto, will have an addition erected, to be of brick construction. The contract has been awarded to Brown & Cooper, 397 Carlton Street, Toronto. The company has received a number of orders from the Imperial Munitions Board for the manufacture of shells.

The Hamilton Gear & Machine Company, Van Horne Street, Toronto, has commenced the erection of an addition to its plant to cost \$7,500.

The St. John Machine & Tool Company's foundry and machine shop at St. John, Que., was destroyed by fire with a loss of \$16,000.

The Reliance Motor & Tool Company, Ltd., Toronto, has been incorporated with a capital stock of \$60,000 by William R. Sturupp, 6 Adelaide Street East; John S. Duggan, and others.

The Van der Linde Rubber Company, Ltd., Toronto, has been incorporated with a capital stock of \$350,000 by Lester M. Keachie, 11 Edgar Avenue; William A. McFarlane, V. T. A. Foley and others to manufacture rubber tires, etc.

The Dominion Crucible Company, Ltd., Montreal, has been incorporated with a capital stock of \$200,000 by Francis G. Bush, George R. Drennan, Alexander G. Yeoman and others to manufacture crucibles, graphite, etc.

The Continental Construction Company, Ltd., Montreal, has been incorporated with a capital stock of \$10,000 by Leopold Choquette, George E. Chart, Lorne C. Herdman and others to build ships, etc.

The A. R. Whittall Can Company, Ltd., Montreal, has been incorporated with a capital stock of \$500,000 by Albert R. Whittall, Westmount, Que., David S. Whittall, Montreal, and others.

The Machine Builders, Ltd., Montreal, has been incorporated with a capital stock of \$50,000 by John W. Cook, Theodore B. Heney, Herbert R. Mulvena and others.

La Compagnie de Pneus Roger, Ltd., Montreal, has been incorporated with a capital stock of \$250,000 by Wilfrid J. G. Roger, Telephore Leduc, Charles R. Lasalle and others to manufacture automobiles, etc.

## Government Purchases

WASHINGTON, D. C., Nov. 6, 1916.

Sealed proposals will be received until 11 a. m., Nov. 27, for one 50-ton locomotive jib crane for the Pearl Harbor, T. H.

Proposals will be received by the Bureau of Yards and Docks, Navy Department, Washington, until 11 a. m., Nov. 20, for three ventilating systems, including blowers, motors, etc.

The general purchasing officer of the Panama Canal, Washington, will receive bids until Nov. 14, under proposal 1096, for furnishing one motor-driven shaping machine.

The names of the bidders and the numbers under which they are designated in the above list are as follows:

### Schedule 242, Construction and Repair

Class 14, Brooklyn—One universal woodworker—Bid 37, \$825; 76, \$924; 79, \$790; 113, \$817.80; 138, \$978.27; 144, \$875; 149, \$870.

Class 15, Mare Island—One universal woodworker—Bid 37, \$872; 76, \$1,092; 79, \$815; 113, \$887.80; 138, \$1,143.27; 144, \$955; 149, \$845 and \$1,050.

### Schedule 254, Ordnance

Class 151, Newport—Steering engines, valve rods, copper collars, etc., for torpedoes—Bid 167, \$1,818.50; 176, \$495.20; items 3, 6, 10, 11, 12 and 18; 249, \$2,012.80.

Class 152, Newport—Ten metal slitting saws—Bid 23, \$4.93; 80, \$6.60; 99, \$5.65; 155, \$8.10; 159, \$7.50; 160, \$5.22; 180, \$6.18; 253, \$5.67; 258, \$8.94.

Class 153, Newport—One inserted tooth circular saw and 40 extra high speed teeth to fit above saw—Bid 99, \$240.80; 149, \$470; 180, \$218.20; 253, \$148.

Class 154, Newport—One metal-sawing machine—Bid 113, \$550.60; 144, \$622, \$637, \$616 and \$477; 149, \$644, \$639 and \$624; 155, \$600 and \$616.20.

Class 155, Newport—One motor-driven high-speed saw—Bid 8, \$355; 113, \$336.80; 144, \$275; 155, \$1,230.

### Schedule 255, Construction and Repair

Class 161, Norfolk—One pipe and nipple-threading machine—Bid 75, \$743; 122, \$1,408.30; 253, \$555.

### Schedule 256, Construction and Repair

Class 162, Philadelphia—One electric spot welder—Bid 157, \$1,167; 197, \$1,135; 222, \$4,000.

### Schedule 243, Yards and Docks

Class 171, New Orleans—One steam hoisting engine—Bid 85, \$2,000; 113, \$1,164.50; 118, \$1,763 and \$1,497; 124, \$1,630; 129, \$1,650; 130, \$1,310, \$1,500 and \$1,690; 164, \$1,240.

Class 172, New Orleans—One steam ram pile hammer—Bid 129, \$760; 143, \$915 and \$1,040; 220, \$770.

### Schedule 244, Construction and Repair

Class 181, Norfolk—Five hydraulic lifting jib—Bid 189, \$1,100; 225, \$1,397.50; 229, \$1,340; 243, \$1,050.

Class 182, Norfolk—One hydraulic beam bending press—Bid 189, \$3,500; 225, \$3,250; 229, \$5,520; 243, \$3,100.

### Schedule 245—Construction and Repair

Class 183, Boston—One outside molder—Bid 10, \$990; 77, \$867.41; 79, \$731.50; 93, \$918; 230, \$1,000.

### Schedule 247, Steam Engineering

Class 191, Norfolk—One cutting-off machine; 1 engine lathe and 1 center grinder—Bid 73, \$876.62, item 2; 76, \$2,185, items 1 and 2, \$1,895, items 1 and 2; 78, \$826, items 1 and 2; 149, \$561 and \$554; 155, \$921; 156, item 2, \$1,070.

### Schedule 248, Steam Engineering

Class 192, Boston—One heavy automatic tapping machine—No bid.

Bid 8, Armstrong-Baum Mfg. Company; 10, American Wood Working Machinery Company; 37, P. Irvin Cheyney; 73, Federal Sales & Service Company; 75, Fairbanks Corporation; 76, Fairbanks Company; 77, Wm. H. Field Company; 78, E. L. Fraser; 79, J. A. Fay & Egan Company; 85, Glover Machine Works; 93, Hall & Brown Wood Working Machine Company; 113, Kemp Machinery Company; 118, Lidgerwood Mfg. Company; 122, Landis Machine Company; 124, Lenher Engineering Company; 129, J. S. Mundy Hoisting Engine Company; 130, Mead Morrison Mfg. Company; 138, Machinery Merchants, Inc.; 143, McKleiman-Terry Drill Company; 144, Manning, Maxwell & Moore; 149, D. Nast Machinery Company; 155, Nutter & Barnes Company; 156, Niles-Bement-Pond Company; 157, National Electrical Supply Company; 164, Orr & Sembower, Inc.; 189, St. Louis Screw Company; 197, W. E. Shipley Machinery Company; 220, Union Iron Works; 222, Universal Electric Welding Company; 225, W. H. Wood; 229, R. D. Wood; 230, S. A. Woods Machine Company; 243, Watson-Stillman Company; 253, Manhattan Supply Company.



## NEW TRADE PUBLICATIONS

**Hammers and Heating Forges.**—C. C. Bradley & Son, Syracuse, N. Y. Collection of circulars. Cover a line of hammers which are made in the helve and strap types, a belt-driven outfit for use where the amount of floor space available is limited and heating forges using hard coal or coke for fuel. The circulars relating to the hammers are practically identical in form and contain an engraving of the particular hammer described and a description of its general construction, supplemented by views of the various parts. Another one of the circulars shows the great variety of forgings that can be made with the hammers. The last circular is concerned with a forge for heating iron and steel preparatory to working under the hammer. The various styles are illustrated and briefly described. Lists of the quantity of brick required for each of the furnaces are given under the illustrations and an engraving of a blacksmith's forge using soft coal is presented.

**Steel Sash.**—David Lupton's Sons Company, Allegheny Avenue and Tulip Street, Philadelphia, Pa. Catalog No. 9. Relates to a line of steel sash for lighting and ventilating foundries, forge shops, blast furnaces, power houses, machine shops, textile mills, multiple-story and office buildings, etc. The catalog has been rewritten since the last edition was issued and a number of interesting views of installations of the Pond truss roof and sash are included. In the revision an effort has been made to present the information in a form that will be understood by the average factory owner, as well as the architect and engineer. In each of the sections into which the catalog is divided a general description of the particular product covered is presented, followed by diagrams of details and arrangements of units, tables of widths and heights and numerous views of installations. Mention is also made of other products of the company, such as steel partitions, steel tube doors, rolled steel skylights and sheet metal fireproof windows. A list of recent installations is included.

**Steam Hammers.**—Sherritt & Stoer Company, Inc., 603 Finance Building, Philadelphia, Pa. Bulletin No. 1. Treats of a single frame guided ram type of hammer for miscellaneous forging and blacksmiths' use with either steam or compressed air. The description of the hammer is supplemented by an engraving and a cross-section showing the valves, valve motion and distribution of metal in the frame. One of the features upon which emphasis is laid is the thickness of the wall of the frame in the throat. A condensed table of specifications for the 11 sizes built, which range from 250 to 4000 lb., is included.

**Grinding Wheels.**—Star Corundum Wheel Company, Detroit, Mich. Catalog No. 9. Shows a line of cup, cylinder and special grinding wheels. The last includes wheels for all of the standard grinding machines, as well as for such work as tool, knife and hollow ware grinding and saw gumming. In connection with the illustrations of the wheels for the various machines, dimension tables are included. Instructions on mounting the wheels, the safe speeds and the selection of grades for different work are presented and a number of tables giving useful information are included.

**Tote Boxes.**—New Britain Machine Company, New Britain, Conn. Two bulletins. The first, No. 1224, is devoted to a nesting tote box which was illustrated in THE IRON AGE, April 13, 1916. A description of the box, which is of one-piece construction, is presented and a table of specifications for the three sizes made is included. The other bulletin, No. 1224-A, illustrates and describes a stacking type of box which was illustrated in THE IRON AGE, Oct. 26, 1916.

**Trucks and Turntables.**—Whiting Foundry Equipment Company, Harvey, Ill. Catalog No. 124, superseding No. 78. Pertains to a line of standard steel trucks for shop use in which the frame is made entirely of steel, the only wooden portion being a flooring of matched hardwood and a turntable for use with industrial tracks in plants of all kinds. The special feature of the turntable is the absence of a center bearing, the entire load being carried on chilled rollers turning on a path near the outside of the table. A number of engravings of the turntable are presented and mention is made of a line of charging, dump, core oven and transfer cars, all of which are illustrated.

**Water Controlling Apparatus.**—Rodney Hunt Machine Company, Orange, Mass. Catalog No. 30, section W C A. Refers to water control apparatus, which includes flumes, penstocks, relief valves, gages, gates, hoists, stands and trash racks. The catalog is divided into sections dealing with each general class of this apparatus and the first page

of every section is given over to an index of the different types. A number of tables of useful information are included and a detailed table of contents supplements those given at the beginning of each of the catalog sections.

**Dies.**—National Machinery Company, Tiffin, Ohio. Forging machine talk No. 17. Calls attention to the use of additional dies in the company's forging machines to eliminate the necessity of using a bulldozer in making a clevis for a brake chain. A brief description of the operation and the dies employed is presented, together with a number of engravings of the dies.

**Coal and Ash Handling Machinery.**—Link-Belt Company, Thirty-ninth Street and Stewart Avenue, Chicago, Ill. Two booklets. The first, No. 288, describes the installation in the woolen mill of the William H. Grundy Company, Bristol, Pa. The apparatus installed is described at some length and the text is supplemented by a number of engravings of the different pieces and a diagram of the complete apparatus. The other booklet, No. 296, describes and illustrates the coal handling equipment in the plant of the Victor Talking Machine Company, which includes a locomotive crane with grab bucket, pivoted bucket carrier and a traveling weighing hopper. The description of the system is supplemented, as in the case of the other booklet, by numerous illustrations and diagrams. In both mention is made of a traveling water intake screen for keeping out driftwood, vegetation and miscellaneous trash from the intake pipe lines to condensers.

**Power Transmission Equipment.**—Medart Patent Pulley Company, St. Louis, Mo. Pamphlet. Lists a line of power transmission equipment which includes steel rim, cast-iron and wood split pulleys; friction clutches, rope driving and hoisting sheaves, couplings, bearings, set collars, shafting, gearing, belt tighteners and countershafts. All of the various members of the line are illustrated, but the descriptions in most cases are short, reliance being placed upon the engravings to tell the story. The line is described in more detail in the company's general catalog and its pamphlets, each dealing with a single one of the members. A number of tables of useful information as to the horsepower transmitted by shafting and belting are included.

**Steam Gages and Valves.**—American Steam Gauge & Valve Mfg. Company, 208 Camden Street, Boston, Mass. Catalog No. 65. Supersedes the company's general catalog issued in 1908 and all other catalogs, price lists or pamphlets supplementary thereto. Illustrations and descriptive matter are presented of an extensive line of gages, valves, indicators, steam traps and kindred appliances for governing, indicating, measuring, recording and controlling steam, water, air, gas, oil, ammonia and other pressures. In a number of cases tables giving the prices for the various sizes that can be supplied are presented. Dimension diagrams and tables of a number of the fittings are presented. Lists of boiler fittings approved for use in Canada and a number of tables of useful information are included.

**Cold Metal Sawing Machines.**—Newton Machine Tool Works, Twenty-third and Vine streets, Philadelphia, Pa. Catalog No. 51. This is the company's catalog describing and illustrating an extensive line of cold saw cutting-off machines. The general specifications for the line, which is divided into bar, I-beam, combination, crankshaft, rail, steel foundry and vertical sawing machines, according to the respective table, saddle or spindle arrangements, are presented. This is followed by engravings and dimension tables of the different types and classes of machines, all of which are of the spindle-driven type. In each case the variations, if any, from the standard specifications are noted under the engraving. A number of engravings of the different machines in use are included. Other products of the company, including milling, slotting, planing, rail drilling and locomotive rod boring machines are illustrated and very briefly described.

**Electrical Distributing System.**—L. K. Comstock & Co., 30 Church Street, New York City. Bulletin No. 2. Mentions the advantages of the company's electrical distribution system for machine shops from the standpoint of flexibility, ease of installation and the securing of ample reserve capacity. A number of engravings of plants in which the system has been installed are presented, with brief descriptions of the work that was done.

**Magnetic Switch Control Apparatus.**—Cutler-Hammer Mfg. Company, Milwaukee, Wis. Booklet M. Describes alternating and direct current types of magnetic switch control apparatus for the iron and steel industry. The control systems are explained in some detail and there are a number of illustrations showing both the apparatus itself and installations of it. A new magnetic lockout switch is described, as well as switches in which the arc produced when the circuit is opened is either quenched in oil or blown out by air.

